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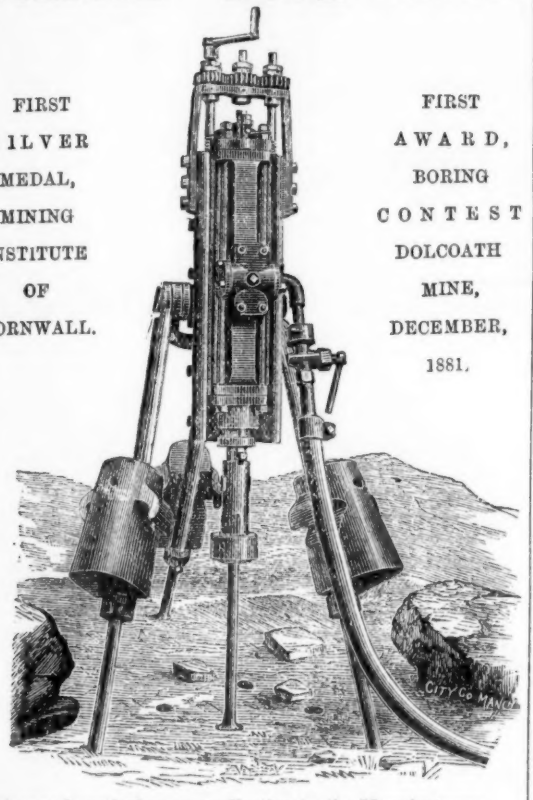

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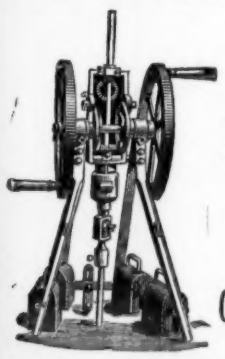

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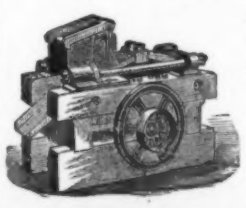

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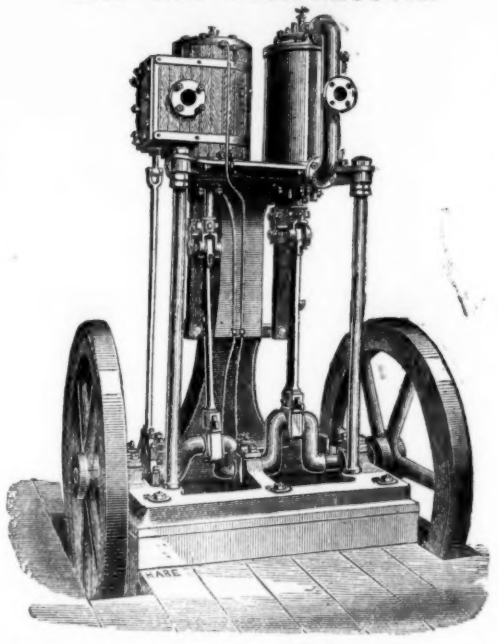

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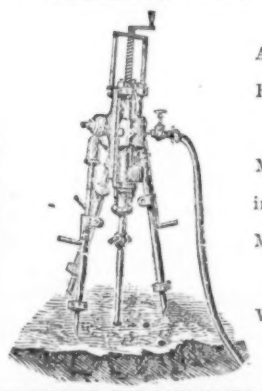

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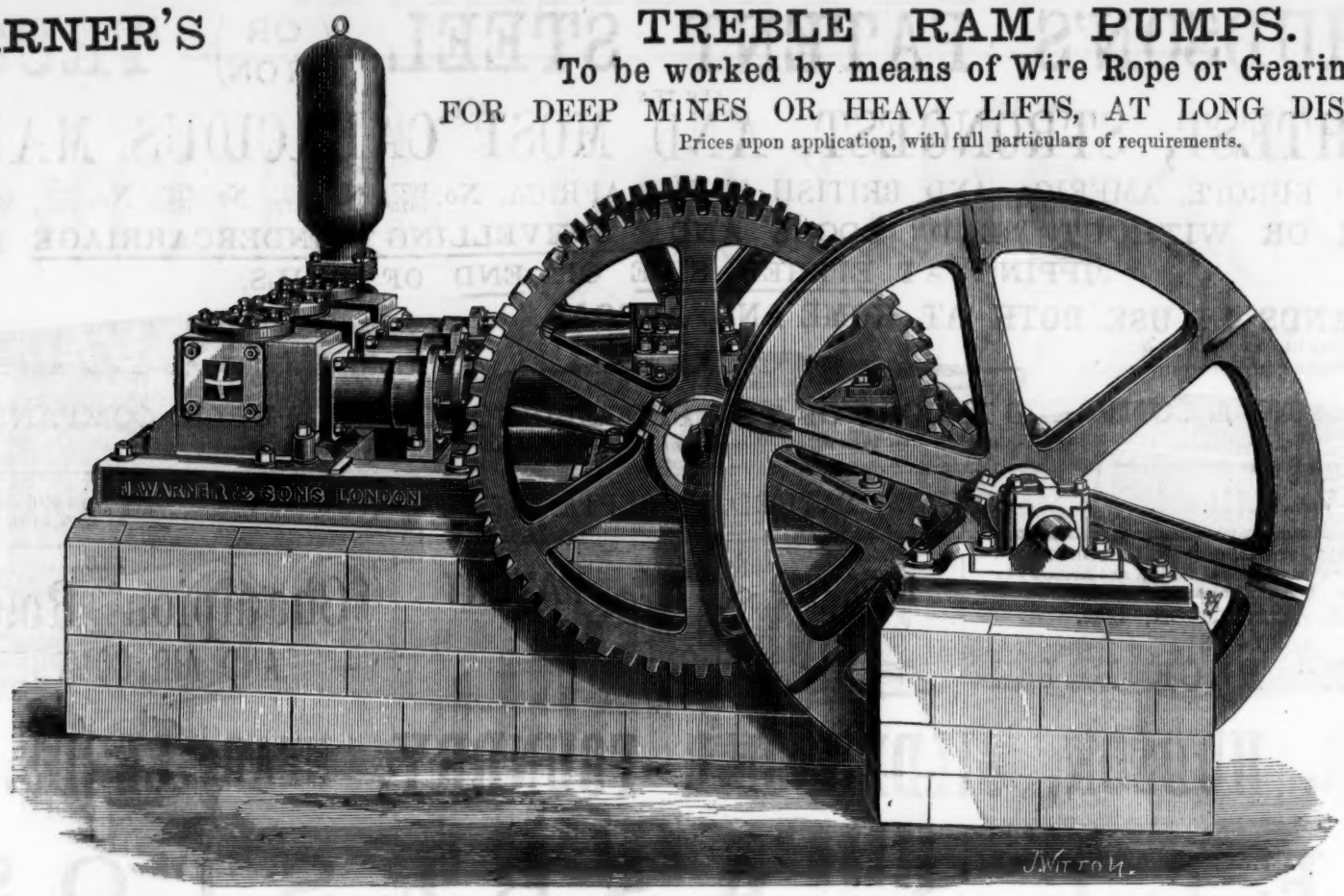

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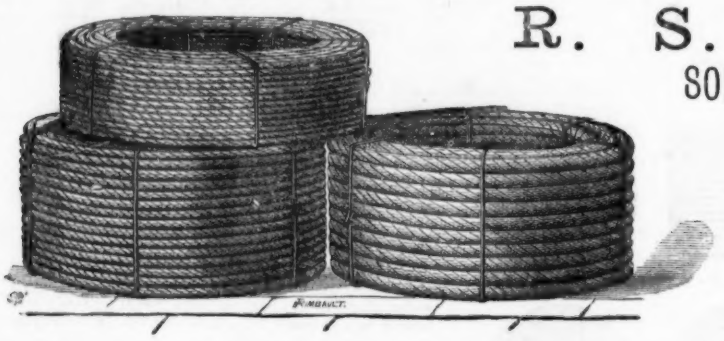

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It is now a recognised fact that the most perfect heat-resisting material suitable for the purpose of a Packing is Asbestos, but to ensure a successful application of this fibre, great skill is required in its selection and manufacture. In this Packing the Asbestos is woven into a stout cloth, and owing to the peculiar way in which it is manipulated, great elasticity is imparted to the Packing. So successfully has this been done, that with light screwing, it has been found in practice that little or no lubricant is required to ensure a minimum amount of friction, and to keep the rods from over-heating. An improved vacuum is always maintained by the use of this packing, which meets with unqualified approval wherever it is applied.

This packing is made in four forms to meet various requirements, viz., as Fig. 1, square; 2, round with solid rubber core; 3, with tubular rubber core; 4, without core, but with rubber inlaid.

As these packings are extensively imitated, and as it is a common practice among dealers and agents to supply the cheaper manufactures at my list prices, users are requested to see that the packing supplied to them bears my trade mark.

BELL'S PURE ASBESTOS PLAITED YARN PACKING. This is the best and most economical Piston Packing in the market for High and Low Pressure Stationary Engines. Of course there are many imitations of a Packing so universally approved of, but I am the Original and Sole Manufacturer of the genuine article.

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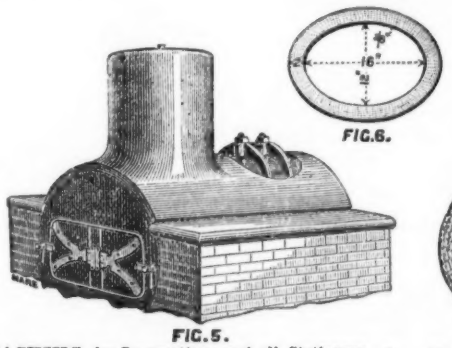

FIG.5.

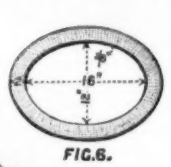

FIG.6.

FIG.1.

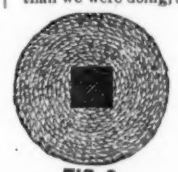

FIG.2.

FIG.4.

FIG.3.

BELL'S ASBESTOS YARN and SOAPSTONE PACKING for Locomotives, and all Stationary Engines running at a very high speed with intense friction.

The following Testimonial refers to this packing;—

Festiniog Railway, Locomotive Superintendent's Office, Portmadoc,
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DEAR SIR,—I have much pleasure in saying that the Asbestos Yarn and Soapstone Packing gives every satisfaction; indeed better than we expected. We have a locomotive packed with it, which has been running five months (and think of the piston speed with our small wheels). I think the Soapstone a great improvement, as it keeps the packing elastic, and prevents it getting hard. I am very pleased with its working, and also the very low price for such good lasting packing. The Asbestos Yarn we find is very useful, and answers admirably.

Yours truly, (Signed) W. WILLIAMS.

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DEAR SIR,—In answer to your request, I beg to inform you that I find the thermometer placed 3 ft. above the boilers now stands at 93°; before your covering was put on it used to stand at 126°. With regard to the saving of fuel, I am unable to speak very accurately, as the boilers were not working long enough before being covered to ascertain the amount of fuel that would be consumed in an ordinary run; but I feel quite justified in saying that we burn less by about 5 cwts. per night than we were doing, and I shall be glad at any time to show the boilers to anyone who may wish to see them, as I consider yours the best covering that I have up to the present seen.

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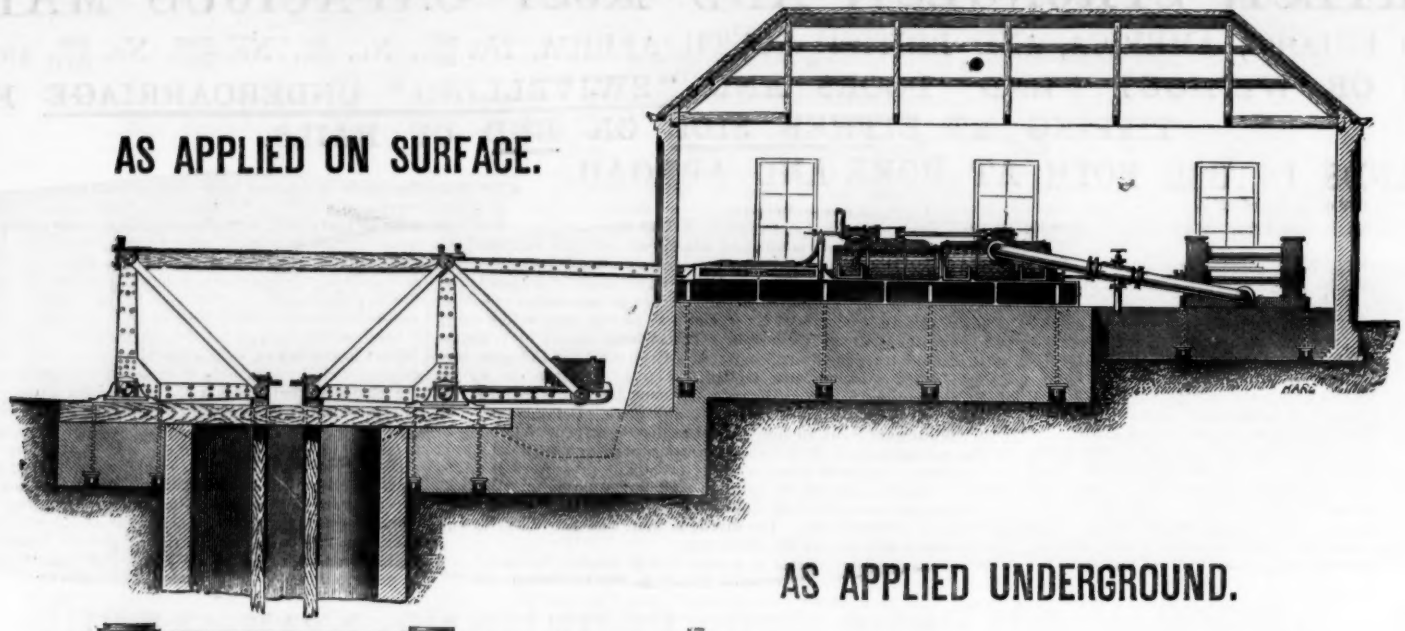

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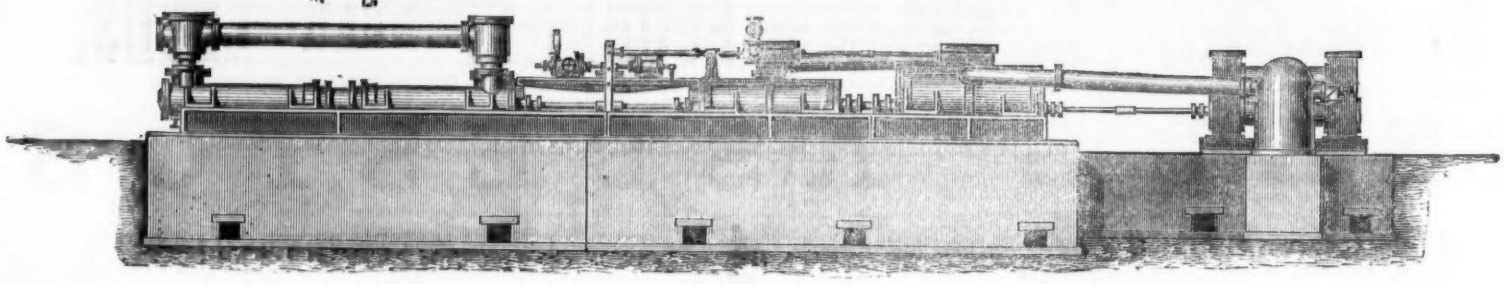

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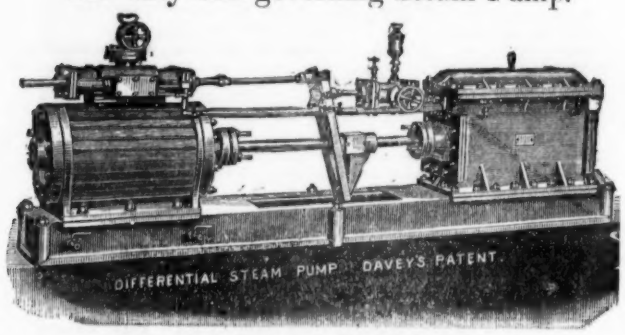

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10	7	15	10,400	130	70	80	100	6	1 1/4	2 1/2
10	9	15	17,300	70	85	100	120	4 1/2	1 1/2	2 1/2
12	6	24	6,500	250	90	104	130	5 1/2	2	2 1/2
12	7	24	10,500	180	96	110	136	6	2	2 1/2
12	8	24	13,500	140	100	114	142	7	2	2 1/2
12	10	24	21,300	90	120	136	175	5 1/2	2	2 1/2
14	7	24	10,400	250	110	130	156	5 1/2	2 1/2	3
14	8	24	13,500	190	120	145	165	6	2 1/2	3
14	9	24	17,300	150	130	150	172	6 1/2	2 1/2	3
14	10	24	21,300	120	140	162	190	7 1/2	2 1/2	3
14	12	24	30,800	80	160	190	216	9	2 1/2	3
16	8	24	13,700	250	140	170	195	6	3	3 1/2
16	9	24	17,300	200	150	180	215	6 1/2	3	3 1/2
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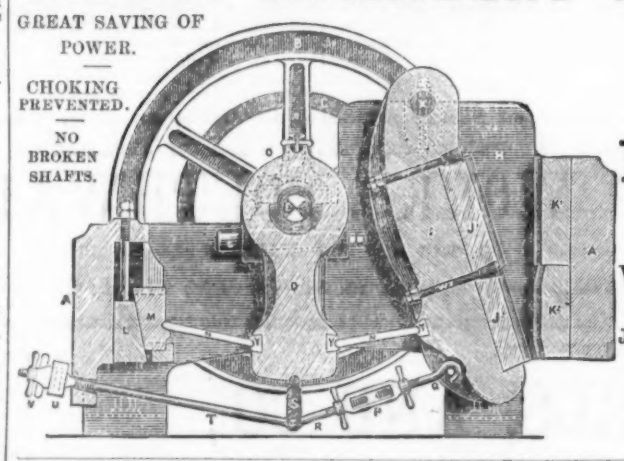

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Original Correspondence.

THE DIAMOND FIELDS AND MINES OF KIMBERLEY, SOUTH AFRICA—No. II.

Continuing his observations with regard to the cost of working, Mr. Paxman states that the first 100 ft. in depth by the present appliances averages about 3s. 6d per load; the second 100 ft. (mostly blue), 5s.; the third 100 ft. 8s.; and the fourth 100 ft., 11s. The increase in the cost of working the two last-mentioned stages is caused chiefly by the slips from the surface, the reef falling into the mines, and having to be removed before the diamantiferous soil can be got at. A tax is levied upon all claims, according to the assessed value, to cover the cost of removing the fall of reef, pumping out water, management, &c.; but the claimholders immediately affected by falling reef always suffer by its interfernce with their legitimate work, and thus the cost is increased, as stated above. A very large slip occurred in the south-west corner of Kimberley Mine in 1880, the clearing away of which has already cost nearly 1,000,000*l.* sterling, and a considerable portion has still to be removed. Another slip, though of less magnitude, took place in the north-east corner in 1882, and in has been decided to clear the whole of the reef away to an angle of 45°.

Water has occasionally been very scarce and dear, and has in times of drought been paid for at the rate of 10s. per barrel of 36 gallons. Water being so difficult to obtain dry-sorting was in operation during several years. This method consisted in passing the soil through sieves in a rocking cradle, but without washing, spreading the residue on the tables and sorting it. This system was superseded by the introduction of washing in 1874, and which is now generally employed. Many and grave mistakes were made at the beginning, which led to waste of labour and capital. Thus the first diggers in the mines, when they had reached the bottom of the red sand, imagined that no diamonds would be found in the underlying strata, and shifted the refuse soil from one part of their claim to another. When, however, they discovered diamonds in the "yellow" the whole of the debris of the "red" in Dutoitspan and Bultfontein Mines had to be again handled and carried away. Much about the thing had to be done with a large portion of the "yellow" soil when diamonds were found in the "blue."

In one or two instances, in the deep workings at Kimberley, shafts have been sunk and connected with the mine by underground galleries. The earth is conveyed through the galleries to the bottom of the shaft, and then hauled to the surface. These galleries are especially convenient in the case of falls of reef, which carry away or dislodge the wire tramways, as work can still be carried on by their means. But shaft sinking is very costly, and, in one instance which came under the author's personal notice a sum of 30,000*l.* was expended in sinking one shaft, and it was computed that the whole of the ground owned by that company could have been cleared out to the bottom of the shaft for a less sum. Native Kaffir labour was very cheap at first. The services of a man could be had for his food and 20s. per month. In 1880 the cost of labour had risen to 22s. per week in money; in 1881 to as much as 30s. per week, and food had to be paid for. The food, however, is not of an expensive nature, the natives mostly living on mealies and a little meat. In the erection of wooden stages for the attachment of aerial trams, handwindlasses, and horse-whims, it is computed that a sum of nearly 750,000*l.* sterling has been spent in the different mines. Thousands of wires were attached, giving the mines the appearance of gigantic cobwebs. All these appliances have now become obsolete, and have given place to the modern and improved methods.

As regards the individual claimholder, he is dependent very much on fortune, for the claims, although they all pay the same royalty, are unequal in value. In some claims large yields have been obtained near the surface, while the lower strata have not been nearly so rich as was expected. In others, the case was reversed; and again, in other claims was found what is called floating reef, which is devoid of diamonds. In 1876 the steam-engine was first introduced at the mines. It was of a vertical type, and was the forerunner of many others of the portable and semi-portable kinds. Among others Mr. Paxman supplied machinery; but, beyond the fact of knowing that fuel and water were both scarce and dear, he was during several years unaware of the real requirements of the case. In 1878 the cost of wood, the only fuel used at that time, had within a short period risen from 7*l.* per load of 5000 lbs. to 14*l.* This quantity is, for heating purposes, about equal to 1 ton of good coal.

Since that time the gradual clearing of the forests in the vicinity, and the consequent necessity of a longer transport, has brought the cost up to 21*l.* per load. Another serious item of cost is the transport of machinery over a long distance in open country, with natural roads only, usually performed by oxen, nine pair to a wagon, carrying a load not exceeding 10,000 lbs. The cost of such transport amounts to from 15*l.* to 30*l.* per ton. In 1881 there were actually at work at the four Kimberley Mines 203 steam-engines, while 29 more were being fixed or were unemployed, making 232. It was computed that there were also 75 steam-engines at the other mines raising the total to 307.

In designing the special machinery, particular attention was paid to (1) simplicity to facilitate the execution of repairs in places where skilled labour is scarce and dear,—2. Effective strength of parts, combined with a minimum of weight, to save expense of transport, which forms so large a portion of the cost at the fields,—3. Construction of engine frames in such a manner that they might be put down readily without foundations, which are very expensive owing to the scarcity of building materials and the high cost of labour.—4. Fuel being very dear, the engines had to be designed to give the greatest amount of duty for the fuel consumed. Wood being the fuel principally used, the fire-boxes had to be of suitable dimensions.—5. In regard to water, which at times is scarce and expensive, the same attention had to be bestowed upon its economy as upon that of fuel. Two types of hauling engines were described in illustration of the paper—the direct-acting engine and the geared engine; also a semi-portable engine for driving the wash mill and apparatus connected therewith.

The direct-acting engine is complete upon its frame, which is of wrought-iron or steel, and attached to timbers ready for being set in position. The winding drums are mainly of wrought-iron. This engine works with 80 lbs. steam pressure per square inch, and a piston speed of 300 ft. per minute; it will haul 850 loads of 16 cubic feet each per day of nine hours a maximum distance of 200 yards; it is of 16 nominal horse power; it is by many preferred to a geared engine to save weight, and to haul the same load at an increased velocity. When desired the wrought-iron frame is increased in depth sufficiently to dispense with the timber framing, and is so made that it requires no further foundation, but can be put down and the engine set to work in the loose soil. The geared engine is complete upon its frame, and is attached to timbers; it has steel gearing in the proportion of one to three attached direct to the wrought-iron winding drum, a brakestrap in some instances acting on the fly wheel as well as upon the rim of the drum; it works with 80 lbs. per square inch of steam pressure, and can haul at the rate of 600 or 700 ft. per minute; it will drag 600 loads of 30 cubic feet each per day a maximum distance of 200 yards; the engine here shown is of 25-horse power,

As the loads vary from 16 to 30 cubic feet in capacity, it is evident that the power provided must be sufficient to haul the load decided upon at the rate which may be desired. In both types of engines the crank shafts, the cross head, crank, and link pins, and the keys and bolts of the connecting rods are of steel. With skilful stoking and careful attendance these engines do not consume more than 4 lbs. of coal per horse power per hour, or 8½ lbs. of wood, and this for actual weight hauled out of the mine. These engines are provided with a water heater of light and strong construction, the barrel being of wrought-iron. Inside the barrel, which is 6 ft. long, a number of 1 in. tubes extend the entire length. The steam passes through the tubes, and the feed water circulates outside. It will be readily understood that much of the steam becomes condensed; a water catcher is, therefore, attached to the heater for collecting it. By this means, with a regular feed supply to the boiler, 33 per cent. of the water is returned; this heater is constructed on the Biddle and Balks boiler principle, so that by breaking the joint at each end the whole of the tubes and the tube plates may be easily withdrawn for cleaning. The boilers are of the semi-portable or locomotive type, and are now made almost entirely of steel to save weight. When wood is burned the fire boxes are constructed extra long to save the labour of cutting up the wood into short lengths. The fire boxes are now made of a mild and very ductile steel, which can be welded. Great care is bestowed in working and annealing it.

In the semi-portable engine which drives the wash mill the boiler and engine frame are made of steel. The engine frame is bolted to the boiler by four angle irons, which arrangement allows the whole engine to be taken off the boiler for convenience in transit, and it can be fixed separately if so desired. The engine may be worked with a steam pressure up to 140 lbs. per square inch, running at the rate of 140 revolutions per minute. The cylinder is 8¼ in. in diameter, with a length of stroke of 12 in., and this engine can be worked with great economy up to 22-horse power. The boilers of this type of engine are made of mild steel, as are also the fire boxes. The engine is provided with Paxman's automatic cut-off controlled by the governor. The cut-off valve is three-ported, and placed within a separate or outer jacket behind the main valve. The cut-off gear consists of a short link, acted upon by two small eccentrics, of which the one that opens the port may be called the positive, while the other, set at a different angle, and which cuts off, may be called the negative. The travel of the positive eccentric is 1¼ in., and of the negative 9-16 in. As the link is lifted this travel is gradually reduced, and by this arrangement any degree of admission of steam from *nil* to three-quarters of the stroke may be obtained with a sharp cut-off, while the lead is constant. It has been found by practical experience that a cut-off at 21 per cent. of the stroke is the most economical when working with 140 lbs. of steam pressure per square inch, and while running at the rate of about 280 ft. of piston speed per minute. The winding engines are now made of compound type with the automatic cut-off similar to that just described. A condenser is also recommended, as the water can be stored in a tank and used for washing. When working with 80 lbs. steam pressure it is advisable to make the area of the cylinder sufficiently large, and the machinery strong enough to do the duty required when cutting off at 25 per cent. of the stroke. The saving both in fuel and water by this arrangement well repays the extra cost.

When wood gradually rose in price coal was sought after and found on the borders of the Rhenoster River, in the Cronstadt district, Orange Free State, about 150 miles north-east of Kimberley; it emits a good deal of smoke, but burns freely without forming clinker, leaving a small amount of clean ashes. The cost of transport by ox wagons is 10*l.* per ton. The coal is now sold at 13*l.* per ton. The wood is of high specific gravity, some of it being almost like ebony or lignum vitæ, which makes it very suitable for the bearings of tubs, wagons, trucks, &c. It is found in practice to wear better than the hardest gun-metal. When used as fuel it burns freely; its heating power compared to coal being 2¼ lbs. wood, equal to 1 lb. good coal.

SOUTH AFRICAN DIAMOND MINING, AND ITS FUTURE.

SIR,—The instability of South African Diamond Mining as an industry has frequently been declared in the *Mining Journal*, and the fact of dividends having been paid did not suffice to prevent your stating in effect that the mine was so badly and unscientifically worked that it was like a house made with a pack of cards, and, therefore, likely to come down at any time. Angry as I was with such statements when published it is but fair that I should now admit that the *Mining Journal* was correct as to the South African stones being of small value as compared with Brazilian stones, and that the market was being swamped with them until the price would be unremuneratively low. They are not yet so cheap as garnets as you predicted they would be, but it is at present much easier to realise profits from dealing in garnets than in diamonds. Kimberley Mine is at the present time like the rubbish shoot at a slate quarry—of no use to anyone but the owner, and of very little use to him That diamonds are there is not doubted, but they only fetch a few shillings per carat, on the average, when got, and the attempt to get them renders the workman liable to premature burial without the benefit of having the funeral service read over him. The mine is, in fact, a vast collection of carelessly dug graves, and present owners are nearly unanimous in opinion that in the near future the concern is as dangerous to property as to life—hence holders of shares or interests in South African diamond mines are doing their best to sell in Europe at high prices if possible; otherwise in South Africa at any price.

But need this state of things continue. Yesterday's Diamond Fields Advertiser gives a full outline of the scheme proposed by Mr. E. Jones for the future working of the Kimberley Mine, and as it seems reasonable and practicable I think it should be known to all holders of diamond mining stock in England. It is remarked that the chief merits of the scheme are that it is suitable for immediate adoption, that it calls for no heavy initial outlay, and that it would result in companies getting at their blue ground at once. Mr. Jones proposes that the anchor-poles of each hauling-engine should be carried down and anchored 50 ft. below the top of the blue, a shaft being sunk through the reef and blue for this purpose, and the ground hauled direct by the tubes, first up the vertical, and then through the open mine on the aerial plan as before. The idea is so simple that the marvel is it has never been thought of before, or if thought of that no one has had the courage to give it a trial. Some of our readers may wonder how it is possible to sink a shaft through the loose fallen reef; but by the adoption of an ingenious device, known as the "coffer-dam," Mr. Jones overcomes all difficulties of this nature. The mode of sinking is as follows:—A timber box without bottom is laid on the surface of the reef in the mine at the point where the shaft is to be sunk, and the loose reef shovelled out from the inside of this box, which consequently begins to sink into the ground. As soon as it has sunk so that its top edge is on a level with the surface of the ground a second box of the same size is bolted into the top of it, and the digging out of the reef from the inside of this shell continued till the second box has sunk far enough into the ground for a third to be added, which is followed by a fourth, and so on until the total depth of loose reef has been pierced, and the level of the blue ground reached. After this the work at once becomes remunerative, whilst the sinking of the shaft through the blue is less costly, as no timber lining will be needed in the blue. Mr. Jones uses a timber casing, as deals are the most suitable material at hand on the fields, but subsequently it may be found advisable in sinking new shafts to line them with iron cylinders specially imported for the purpose, and in some circumstances shafts lined with masonry may be adopted.

It has been noticed that the same tubs are used for hauling up the vertical shaft and through the open mine; at the edge of the shaft a suitable head-gear is erected for guiding the tubs of the aerial tram into the shaft. About half-way down the shaft, or some 25 ft. below the top of the blue, a platform is fixed, to which the tubs are lowered to be filled. In starting work in a new shaft the ground will be cut away to an angle sloping upwards on the four sides of this platform, to which it will slide, and run into the tubs of its own gravity. As soon as sufficient ground has been cut down to reach the angle of repose, headings will be started, and tunnels driven in every direction, the ground being then brought to the platform by tramways and trucks. This mode of working will result in a network of underground galleries which will "honeycomb" the entire area of the mine. Pillars of blue ground will be left standing at suitable intervals, and also a sufficient crown of blue ground overhead to support the reef; but it is estimated that 80 per cent. of the diamondiferous ground may be safely removed in this manner, and when one level of workings has been completed it will even be possible to let down the crown and remove the ground that was left to protect the galleries. As soon as one level of workings has been exhausted the poles will be lowered and a second level of workings commenced in the manner described. Of course it is the main feature of the scheme that all pulling of reef may be stopped, which would naturally lead to the abolition of the reef tariff as superfluous. It is clear that the continued pulling of reef from the centre and lower portions of the mine is one cause of the higher reef falling and shifting; but when all reef pulling is stopped, the fallen reef will very soon assume such a state of rest that head-gear and machinery may safely be erected on the top of it. When this period is reached the shafts in the mine will have sunk to such a depth that it may be advisable to fix separate hauling engines at the top of them to pull the ground up the vertical independently of the aerial tram engines on the main reef, the latter being used to pull the tubs into which the ground will be tipped as it emerges from the shaft. When all open workings have been abandoned it will also be possible to arrange a permanent system of drainage, free from many of the objections that attach to an outside tunnel system, and also at much less cost—as the pipes could then safely be laid in the open mine and carried up the reef to the main pumping-engine, which could be fixed on top. Mr. Jones proposes to make his shafts of an oblong shape, 12 ft. by 5 ft., to admit two tubs or cages, allow also space for drainage and ventilating pipes, as well as room for ladders by which the underground workings would be reached.

There can scarcely be a question, as the Advertiser truly remarks, that great saving of life and freedom from injuries to workers would result from such a system. Some questions have been asked as to the mode of making loose the ground in the tunnels, but no difficulties would be experienced in this respect—dynamite would be used as heretofore, and since freedom from stoppages by reef slips would render it possible to work steadily all the year round, a much smaller daily output would mount up to a handsome annual total, and probably companies now hauling 500 or 600 loads per day, would find it profitable to haul only, say, 200 daily, with a smaller staff and reduced expenses. It is very likely that the adoption of this scheme would lead to the employment of more navvies and white labour in the mines, which would be good for the trading interests generally, and might help to lessen the inconveniences of a fluctuating labour market. A merit of Mr. Jones's scheme is that it is equally applicable to an amalgamated mine or one worked in small holdings. At the present time it would be possible for adjoining claimholders to work together for drainage and ventilation and general convenience without an actual amalgamation of capital. Proper surveys would, of course, be made, and a block-plan kept in the office of each company, showing the exact state of progress of their underground workings, which the surveyor would check and record on the plan each day, and the quantity of ground hauled, or that still remaining on any level in any particular claims, could be calculated at once to a nicety. We cannot leave our description of Mr. Jones's scheme without drawing attention to its superior merit as compared with the alternative system proposed of constructing expensive shafts and tunnels outside the mine. It calls for little initial outlay, and affords immediate relief to our depressed finances, as within a few weeks of starting work the blue ground could be on the floors.

But the great recommendation of Mr. Jones's scheme is that which is left for consideration to the end of the outline—its extreme economy; it renders the vast expenditure, differently estimated at one or two millions sterling, for dead work absolutely superfluous, and would seem to allow an early abolition of the burdensome reef tariff; and, lastly, it avoids the very great danger of letting outside water into the mine, a consideration that cannot be too strongly urged on those concerned. At present the mine is comparatively free of water, but if three or four deep shafts were sunk outside the reef, and tunnels driven into the mine, pumping difficulties might ensue that would seriously interfere with its future profitable working. Now, it will, I think, be obvious to the readers of the *Mining Journal* that although it would be almost suicidal to embark in any scheme for purchasing claims in the Kimberley Mine with the prospect of even 1,000,000*l.* expenditure for dead work staring them in the face, the adoption of Mr. Jones's scheme would so materially improve the prospects of South African mining that it would not be an unattractive channel for speculation. CYMRU.

Kimberley, Sept. 2.

MINING ON THE GOLD COAST.

SIR,—I am glad to find that some attention is being given to the Guinea Coast Gold Mining Company's affairs. More than two years have elapsed since I took a good number of shares in this concern, and from enquiries made since the appearance of your communications from "W. J." and "R." it would appear that Mr. Sweet, the company's manager out there, is not at all satisfied with the property at Izrah, as I learn the directors are now entertaining another proposal from the vendor, Mr. Irvine, to take over another concession at or near Tariento, which is declared by Mr. Sweet to be the richest claim on the Gold Coast. It is all very well for the Chairman to say that if we are disappointed so are the board. I consider the board are greatly to blame for taking over the properties on the bare statement of the vendor, and those whose reports accompanied the prospectus, statements which can only now be entirely distrusted. It is quite time that the shareholders be made acquainted with the true position of the company's affairs, and I shall be happy to join with "W. J." and "R." in calling a meeting of them with a view to obtaining a true statement.—*Ealing, Sept.* 24. R. C. D.

BRITISH ENTERPRISE ON THE GOLD COAST.

SIR,—I agree with "R" that the Guinea Gold Coast shareholders are entitled to a straightforward statement of their position. We ought to be informed why the directors paid the vendor 43,000*l.* in cash for the property without taking care to ascertain that his agent's statements were true? The directors are especially bound to explain this, for two of their number belonged to a syndicate that is said to have netted an enormous sum by the sale of this company. The directors are bound also to explain when and why they resolved not to fulfil the promises of the prospectus as to machinery. Also why at the general meeting they kept back the results of the assay the samples which Capt. Burton got from the property, and of the trial of the hydraulic process which he recommended. Why, too, it was necessary to pay Capt. Burton 800*l.* to go out merely to take possession of the property? To me this expenditure seems a very reckless throwing away of money.

No doubt, too, shareholders would like to know why Mr. Peddie retired from the board? That there was a good and weighty reason there can be no doubt. The question is whether the shareholders will allow the little balance of capital left to be expended in paying directors' fees and the salaries of the officials. That there will be no other result if things are allowed to go on as now I am perfectly satisfied.—*New Broad-street, Sept.* 25. R. H. P.

THE NEW GOLD FIELD IN VICTORIA.

SIR,—The discovery of the new quartz reefing gold field on the Dark and Mitta-Mitta rivers, with such excellent prospects as foreshadowed by the news from the Argus (Aug. 13), will be likely to give a fresh stimulus to prospecting the large extent of undeveloped auriferous country in the Omeo, Beechworth, and Gippsland mining districts. Already a considerable number of leases have been applied for, and a big rush is likely to set in to the district when the winter is over.

The discovery was kept secret as long as possible, to enable the prospectors to secure for themselves a good slice of the New Eldorado. It appears the first news heard of the discovery in Melbourne arose from an advertisement from one of the prospectors for the assistance of capitalists, which was responded to by some Melbourne speculators, who, having inspected the locality and satisfied themselves of the *bona fides* of the discovery, purchased the prospector's claim, formed a company (the Mascotte Gold Mining Company), purchased and erected a battery, and will now be busy crushing.

The whole country about there is very mountainous, and during the winter is, in many parts, covered with snow; but not to such an extent as to prevent work. The summer weather will be delightful. I have always had a high opinion of the auriferous character of this part of the colony, and strongly advocated the prospecting and developing the mountain ranges of the western slope of the Australian Alps.

An immense extent of country lies here ready for exploring, inviting willing and enterprising men to settle and develope the mineral riches of the ranges, and the agricultural and pastoral wealth of the valleys. The Argus reports with regard to gold and the gold fields:—

A considerable amount of public interest has been displayed lately with regard to some new quartz reefs discovered at the Dark and Mitta-Mitta rivers in the Beechworth mining district. The Argus recently dispatched a special correspondent to the locality, which is very difficult of access, and his report is to the effect that the quartz reefs that have been found show excellent prospects on the surface. There are three companies at work on the Dark river, but only one of them, named the La Mascotte, has placed any large quantity of stone on the surface. The La Mascotte expects to have a crushing of about 100 tons next week, and it is believed the yield will be very good, as nearly all the stone shows gold. The other two companies, named respectively the Young Australian and Dark, have also excellent prospects, the stone in their claims showing gold freely. At Lawson's Creek, a tributary of the Mitta-Mitta river, there are five or six companies working on reefs which are all well defined, and the majority of which carry heavy quartz gold. An important mineral discovery has been made at the Thackeringa Mine, Barrier Ranges, New South Wales. The mine, which is situated near the South Australian border, about 150 miles from Wilcannia and 170 miles from the Terowie railway station, is owned by Mr. Richard Green, of Bourke, who has worked it since 1880 for galena, silver, and lead. A good deal of the ore, which did not present the ordinary appearance, was laid aside as worthless, but one of the miners having expressed the opinion that it contained silver, Mr. Green was induced to have an assay made. A sample of the ore was submitted to Mr. J. James, assayer for the Burra Burra Company, who reported that the ore contained silver in the proportion of 3430 ozs. to the ton. Another sample of the ore was brought to Melbourne, and handed to Mr. Cosmo Newbery for assay. His report is to the effect that the ore contains silver to the extent of 4222 ozs. per ton. At this rate the value of the ore would be something like 800*l.* per ton.

The vexed question of "What to do with our boys?" may be easily solved in many cases for those with pluck or grit, as there is room for thousands of them out there who are willing to work and prospect for gold. Plenty of good beef at 3d. to 4d. per pound; they can build and live in their own huts without rent, and as prospectors, as a rule, do not indulge in expensive luxuries they can live tolerably well at about 10s. to 20s. a week. There can be little doubt that the gold yield of Victoria will be soon materially increased by the new discoveries in these mountain regions. All that is wanted is labour, and capital for machinery.

THOMAS CORNISH,
Author of Gold Mining, its Results and its Requirements.

GOLD MINING IN NEW SOUTH WALES.

SIR,—Under the head of Mineral Products of New South Wales, by Mr. Harrie Wood, Under Secretary of Mines, is an able description of the varied mineral resources of this extensive and thriving colony. Mining for gold in Australia commenced in the year 1851, but the discovery of gold is recorded as far back as 1823. Mr. Surveyor M'Brian in his Field Notes of the Survey of the Fish River, between Tanana and O'Connel, states: "At 81.50 to river and marked gum tree. At this place I found numerous particles of gold in the sand in the hills convenient to the river."

In 1839 Count Strezelecki found auriferous pyrites.

In 1841, Feb. 23 and 24, Rev. W. B. Clarke, M.A., F.R.S., discovered gold *in situ* in the granite formation between Hartley and Hassan's Walls and at the head of Winburndale rivulet. He afterwards spoke of gold as likely to be found in abundance. In 1844 he showed a sample to the Governor of New South Wales, Sir George Gipps, who said, "Put it away, Mr. Clarke, or we shall all have our throats cut."

Several other discoveries were made between that date and 1851, when, on April 3, Mr. E. H. Hargraves, who had recently returned from California, addressed a letter to the Colonial Secretary, that he had been prospecting for two months, and offered to point out the localities in which gold was discovered, the remuneration for which was left to the liberal consideration of the Government. The localities named by Mr. Hargraves were—Lewis' Ponds and Summer Hill Creeks, Macquarie, and —— rivers, in the districts of Bathurst and Wellington. Mr. Stutchbury, the Government Geologist, was instructed to inspect and report. This Mr. Stutchbury did on May 14, confirming the news of the discovery, and by May 25 not less than 1000 persons were at work on Summer Hill Creek, many of them getting large quantities of gold.

Prospecting operations were immediately directed to other districts throughout the colony; but, on the discovery of the gold fields of Ballarat, Mount Alexander, and other places in Victoria, shortly after, many diggers left for the new discoveries. Since 1851, when the auriferous deposits were first discovered, the quantity of gold raised, so far as can be ascertained, is 9,225,179 ozs., valued at 34,343,857*l.*

Gold has always been found in association with certain formations, and the extent of country occupied by these is about 70,000 square miles, or nearly one-fourth of the whole area of the colony, a considerable portion of which has not been touched by the pick of the miner.

Gold-bearing quartz reefs have been found in New South Wales in sedimentary rocks of upper silurian, devonian, and carboniferous ages, also in hornblendic granites, porphyry, diorite, and serpentine; while the deposits which contain alluvial or water-worn gold in paying quantities, and which have been derived from degradation of these formations, are of the permean, cretaceous, tertiary, and quartunary ages. Auriferous quartz reefs in the upper silurian formation have been worked at Hill End and Tambaroora, Trunkey, Temora, Mount Brown, &c.; in the devonian at Nana Creek, Boorook, &c.; in the carboniferous at Barington or Copeland; in hornblendic granites at Braidwood, Adelong, &c.; in porphyry at Grenfell; in diorite at Gulgong, Temora, Parkes, &c.; in serpentine at Gundagai, Lucknow, &c. The reefs vary from a few inches to 10 ft. in width.

At Hill End portions of the reefs contain potash, mica (muscovite). In some places the mica was found to entirely replace the quartz, and here the gold was found to be excessively rich. On several of the gold fields the reefs contain much pyrites, which, on assay, have been proved to be more or less rich in gold. New South Wales doubtless offers a very promising field for the introduction of efficient appliances for the extraction of gold from pyrites.

A high yield of gold has, in some instances, been obtained from the silver lodes of Boorook, the ores from which consist of chloride and sulphide of silver, with a little iodide of silver. The greatest depth at which auriferous reefs have been worked in New South Wales is 940 ft.—in the Adelong United Gold Mine, Adelong. Gold has been recently discovered in the marine conglomerates and shale beds, which are believed to be of cretaceous age, and which rests upon the flanks of the silurian, devonian, and granite formations in the Mount Brown or Albert Gold Fields. It is probable that these marine beds will be only found payably auriferous where they fill hollows or "gutters" in the surface of the older formations. In many localities the old river beds, or "leads," as the miners term them, have been overwhelmed by flows of volcanic rocks, which are sometimes 200 ft. thick, shafts having to be sunk through the basalt, as in the Forest and other gold fields, to reach the gold-bearing gravels; but where, as on the Cudgegong river, &c., the basalt has been completely cut through by the subsequent erosion of the valleys, the leads may be readily worked from adits driven under the basalt.

From 1546 loads of wash dirt from one of the rich claims (four men's ground) on the Happy Valley lead, near Gulgong, 6203 ozs. of gold were obtained; and from a claim on the Canadian lead, on the same gold field, seven men in three years obtained, free of all expenses, gold to the value of 28,000*l.* One ounce of gold per load, though above the average yield, is not an uncommon return from the wash dirt of the pliocene leads. Such leads are at the present time (1882) being worked within the Temora gold field, where the depths of sinking before reaching the auriferous drifts varies from 30 to 200 ft. But upon the Gulgong, Parkes, Forbes, and other fields of gold-bearing fame, some of the leads have been followed into deep ground, where owing to the heavy influx of water they could not be profitably worked by the ordinary manual efforts of the miners. However, with the aid of steam-power and improved gold-saving appliances, they will probably afford remunerative employment for many years to come.

Taking into consideration, therefore, the above-mentioned deposits not yet worked out, together with the large extent of country occupied by formations of an auriferous character awaiting the search of the prospector, gold mining in New South Wales may be regarded as an important and permanent industry.

As an instance of the extensive field for gold mining operations in this colony in the vast area of gold-bearing country, about 70,000 square miles, only 7556 miners are engaged in gold mining, or about one man to each 10 square miles.

THOMAS CORNISH, M.E.,
Author of Gold Mining: Its Results and Its Requirements.

METALS IN THE SOUTH EASTERN STATES OF AMERICA.

SIR,—I subjoin an extract from a paper published at Oxford in this State, which gives an interesting account of some copper veins that have recently been opened. It appears that Dr. A. R. Ledoux has visited the Museum, and expressed a high opinion concerning it. Looking at the minerals he told a reporter of the discovery of extremely valuable copper ore in Person County. He has just returned from a visit to this. It is of surprising purity and abundance, and is in a belt 10 miles long and 3 miles wide: 30 or 40 years ago a small shaft was sunk there, but nothing done. A year ago the place was re-discovered. Very quietly purchases of the land were made. Now 20 shafts are down, 200 men are at work, and heavy shipments of ore are being made to New York. Boston people are heavy investors there, while not a few New Yorkers are interested. In fact, said Dr. Ledoux, the purchases of miners here are nearly all made in a quiet way. Nothing is to be done here in the way of speculative mining, but when a man makes up his mind to buy a mining property then comes and lives at the spot, and look after his mine as he would after his store, he is sure to make with good judgment 30 to 40 per cent. on his investment. In no State does such mining pay as well as in North Carolina. These Person mines are immediately upon the line, and several developments have been made in Granville; in fact, we are informed that rich ores have been shipped from two points already to Boston.

Minerals are, as the Monthly Bulletin of the North Carolina Department of Agriculture truly says, found in great variety and abundance over a large part of the State. Among the more useful and important are the following:—Marl, iron, coal, peat, limestone, gold, copper, silver, lead, zinc, mica, graphite, and corundum; besides manganese, kaolin, fire-clay, talc, pyrophyllite, whetsone, grindstone, and millstone grits; a great variety of building stones, serpentine, marble, chromic iron, barytes, oil shales, buhrstone, roofing slates, and several precious stones, as diamond, agate, garnet, sapphire, ruby, beryl, amethyst, and opal. Marl is found only in the eastern region, but is very abundant in some 25 counties, occurring in extensive beds, which contain all the elements of a complete and permanent fertiliser, an occasional dressing (once in 15 or 20 years) being sufficient to render a poor soil permanently productive. This is the most valuable mineral in the State, as it is easily accessible to more than half of its farming lands, and is applicable to all crops.

The State contains a vast quantity of iron ore of every variety, distributed over a very wide area from the head of navigation on the Roanoke—for example, for nearly 400 miles westward to the extreme limit of the State, being found in workable quantities in not less than 30 counties. But a more important fact than the variety or the abundance or the wide distribution of these ores is the remarkable purity of many of the deposits. Iron has been smelted for 100 years in the middle and western counties, both in forges and furnaces; but only in quantities sufficient for neighbourhood consumption. Much of this iron, though so rudely prepared, is equal to the best Swede, being, of course, like that, reduced with charcoal. The most abundant kind of ore is magnetite, and most of the iron hitherto manufactured in the State has been made of it; but red hematite is scarcely less abundant, and limonite is very common. Two kinds of carbonaceous ore occur in association with the coal—the Scotch blackband and ball ore (calcareous siderite). Many of the beds of the two former ores, magnetite and red hematite, are entirely free from both sulphur and phosphorus; some of them contain manganese, others titanic acid, and still others both of these minerals, together with a small percentage of chromium. Such deposits in such quantities and of such purity remain undeveloped only because occurring in a region heretofore little accessible, and only devoted to agriculture. But their high value for the manufacture of the best kinds of cutlery steel, and for the Bessemer rail, is bringing them prominently into notice and demand. A reference to the map will give a general view of the wide distribution of these ores.

The coal of this State is of Triassic age, mostly bituminous, is a good smith and gas coal, and is also well adapted to iron smelting when coked. There are two coal beds, both in the middle region—one on Deep River, mostly in Chatham County, the other on Dan River (upper waters of the Roanoke), in Rockingham and Stokes Counties. The thickness of the workable seams ranges from 3 to 7½ ft. thick. The outcrops are respectively estimated at about 30 and 40 miles, and the probable breadth at about three miles in one case and one to two in the other. Both of these coal beds are in immediate proximity to some of the most extensive and valuable iron ore deposits in the State, and on navigable streams. Peat exists in very large quantities (several hundred square miles in area and many feet thick) in the counties near the seaboard. It is used extensively as a fertiliser by the best farmers, and will doubtless some day be of great value for fuel.

Limestone, though not abundant in the State, is found in more than 20 counties—some of them in the eastern, some in the middle, and some in the western region. That in the east is of Eocene age, and is a shell conglomerate, valuable both for building purposes and for the manufacture of lime. The limestones of the middle and western regions are of Huronian (pre-silurian) age, and are frequently crystalline, and in several counties constitute a very good marble, in Cherokee and Macon especially, where are found several fine varieties and colours of this stone—white, black, grey, red, flesh-coloured banded, and mettled.

Gold is very widely distributed through the older rocks of the middle and western sections, being found in workable quantities in 29 counties. The first gold mines in the United States were found here about 1820, and they were wrought on a very large scale until 1847, yielding many millions of dollars. There has been comparatively little done in these mines since the discovery of the California deposits, although a number of mines are still wrought from Halifax to Cherokee. The mineral is found in various gangues, besides the free gold of the drift, or gravel beds, chiefly in quartz, quartzitic slates and conglomerates, chloritic and talcose slates, felspathic, slates, limestone, and gneiss. Before the discovery of the California deposits the largest nugget in the world had been obtained from this State (Cabarrus County) weighing 28 lbs.

Silver, lead, and zinc have been mined to some extent for more than 30 years in the middle region, chiefly in Davidson County, at Silver Hill and the neighbouring mines, and recently they have been discovered in several of the western counties. Copper has been found in more than a dozen counties, and a large number of mines have been opened in the last 20 years throughout the middle and mountain regions, and were wrought quite extensively before the war. Four or five of them have been re-opened since, and one—Ore Knob, in Ashe County—has been put in operation on a large scale. Its ores occur in rocks of both Laurentian and Huronian age, chiefly in a gangue of quartz, but also in hornblende slate, syenite, and tremolite, and in talcose and argillaceous slates, Most of the gold veins of the State contain copper in large part, and some of the mines of copper were first opened as gold mines. It exists mostly in the form of copper pyrites, although the other common ores are of frequent occurrence.

A great many mines producing mica have been opened in the last six or eight years in some of the western counties of the State in the Archæan rocks. It is found in ledges (veins) of very coarse granite. Many of the plates of mica are of remarkable size, reaching 3 ft. and even 4 ft. in diameter. Graphite is very abundant in the State, both in the middle and west, existing chiefly in large bedded veins, generally more or less earthy and slaty, but occasionally quite pure and crystalline. It has been wrought on a large scale at several points. One vein, a few miles from the capital, is one of the most extensive known, having been traced 15 miles. Corundum has been found in large quantities in several counties west of the Blue Ridge, and is now extensively mined. Several valuable rubies and sapphires have been obtained, among them a crystal of 312 lbs., which is in the Cabinet of Amherst College, Massachusetts. The principal use of this mineral is in the manufacture of the finer kind of emery, for for which purpose it has no equal.

Chromic iron is of common occurrence in the same region. Several veins of the black oxide of manganese of considerable extent have been found. Barytes is found in large veins in the western and middle counties, and is exported to the northern states, to be used, among other things, in the manufacture of paints, as a substitute, in part or in whole, for the lead carbonate. Granite, marble, and sandstone abound everywhere. Half-a-dozen diamonds have been found accidentally in washing gold gravels, some of them of considerable value. Oil shales exist in great thickness in connection with the coal beds, and yield a large percentage of oil. The other minerals mentioned are of common occurrence. Of mineralogical curiosities there is a larger number found in this State than in any other of the United States.

I have seen samples of the ores, grey and purple copper, referred to above and am informed that they yield 60 per cent. of metal. They certainly are very beautiful, and the appearance well supports the above quotation of their value. I wish it were possible to excite interest enough in England to work the riches of these States. The Monthly Bulletin, published at Raleigh, the capital of this State, in July, 1883, by the Board of Agriculture, is, of course, authentic, and it will be seen that the officers treat of the metals and minerals found here in much detail. It shows, too, that prior to the discovery of gold in Australia and California the largest nugget found in the world had been obtained from this State (Cabarrus County), weighing 28 lbs.

HENRY MOON, M.E.
Thomasville, North Carolina, U.S., Sept. 8.

MINING ECONOMICS—HOW TO EARN PROFITS.

SIR,—If comparisons are odious, contrasts if not agreeable ought to be instructive. Between the wealth of products of home and foreign mines—I write from an English point of view—the contrast is most marked and decided; so also is it in respect of the expenses. That these are facts cannot in a general sense be ignored; but the question is, Is the relation to each other consistent and legitimate? That is, is the one consonant with the other—the resultant effect of inevitable natural conditions or local surroundings—to anything like the extent to which it occurs. From my outlook here recklessness in the purchasing of mines at exorbitant and unwarrantably high rates when better properties could be obtained on a sufficiently long tenure of lease at moderate royalties, or a reasonable share of the profits, appears to me a wantonly lavish expenditure of money, betraying an utter disregard of economy at the outset; and if recklessness is manifested at the initial point of procedure subsequent proceedings are more likely than not to be corrupted by that error, and hence to become fundamental of pernicious results. If one quarter of the money paid for the purchase of inflated concerns had been properly applied in the development of well-selected virgin mines live issues of teeming wealth, and gladdening profits would have accrued. Mining, like every other industrial or commercial pursuit, should be regarded from a pounds shillings and pence point of view—what the first cost, the cost of maintenance and conduct, the product actual or prospective, and the amount of difference, if any, between the two—are the vital and should be the regulating as well as the stimulating considerations of any and every enterprise. The first cost of a concern is the initial point at which economy should be exercised, the fundamental plane on which will depend the full comparative measure of its success, as well as constituting the herald and index of future proprieties in the conduct and maintenance of all practical systematic proceedings. "Example is better than precept," "Like master like man," are aphorisms which will never lose their significance in the practical affairs of human conduct, and in respect of mining and kindred industries their significance is paramount. The force of example from the summit of authority and power downwards is like that of gravitation, radiating from its centre upwards and outwards inversely as the square of the distance. If recklessness is displayed in the purchase of a mine it is highly probable that a similar want of prudence will be manifested as a characteristic feature in its future practical outline and progress. If it were cheaper in the long run to buy mines right out than to lease them for a moderate and reasonable share of the profits or products, by all means let it be done; but the analogy of experience shows that it is not. The first costs of many foreign mines have sealed their doom. Were the axe laid at their root the prelude of their demise, inasmuch as the amounts paid for their purchase were so many dead weights, unproductive factors, of no avail in realising returns, as it has not gone into but out of the concerns with no equivalent in value of work done or discoveries made. The mania for high-priced mines is actuated more from assumptions than from well-poised and well-balanced facts. To pay a good price for a good thing is unquestionably an equitable transaction; but in the matter of mining it has frequently been found that the major and minor promises of the proposition have not manifested a satisfactory relationship; the price paid was an entity, the mine as represented non-existing. If certain shares of stock are purchased at 50*l.* each, and certain others of equal value at 5*l.* each, the two investments will be widely different enterprises. What would be a meagre percentage of profits on one—say, 5 per cent., would be 50 per cent. on the other—and this holds good in respect of the first purchase. If mines are purchased at 1,000,000*l.* sterling—one at least has been in this country—and if the leading newspapers of the State of Nevada are not misinformed, and do not publish deliberate falsehoods, another has been sold recently to English capitalists at 735,000*l.* What the first has resulted in so far is matter of history—what the latter will result in, if such a purchase has been made, which is very doubtful, remains to be seen; but if it turns out to be no better investment than the former it is not difficult to see how much better it would have been and still would be to work such mines on royalties, whether of profits or products.

That mines of far surpassing value to many, if not most, of the sensational species can be had on lease for terms extending from 21 to 40 years I have not the least doubt of whatever. But supposing the Emma Mine, for that is one I have referred to, had been something proportional in value to what it was represented to be, but that the then proprietors of that property had not the means of providing the necessary mechanical and other appliances for making its resources available, where would have been the injustice to them to have leased the property to a company like the Emma for a term of 21 to 40 years at one-quarter of the profits? That mine was not represented as a speculation, but as an investment teeming in wealth with unlimited resources. The legal interest of most, if not all, of the States and Territories of the Pacific Slope of the United States is not less than 10 per cent. per annum; that being so, the rate of interest from the best mining investments ought not to be less than 20 per cent. Allowing that 100,000*l.* would be requisite as the subscribed capital of the company for developing the mines, providing the necessary plant of machinery for all purposes of mining, milling, smelting, and a fund for contingencies, an annual profit of 26,600*l.* would be necessary to pay the interest annually, and five years to repay the amount subscribed without interest; another term of five years would be required at a similar rate of profit to pay the accrued interest on the first term of five years, which would merely amount to 10 per cent. on the subscribed capital of the company for a period of 10 years, during which time the lessors would receive 66,600*l.* without any outlay, risk, or liability; and if the profits were greater or less than I have here instanced they would be proportionally benefited or affected. Those that sow should reap; those that invest should realise the just returns of their outlay in equitable proportion. The failure in the case adduced is not an exceptional one, except for the notoriety its has acquired; and it is because of its prominence that I instance it as an illustration. No excessive amount of money should be paid for a comparatively undeveloped mine. The more exceptional appearances in its favour were the greater suspicion as to its legitimacy should attach to it. Abnormal phenomena in Nature are prone to be eccentric and unreliable, and no

exception should be admissable in favour of such occurrences which do not coincide with naturally associated conditions, which when rightly interpreted may render such phenomena superficially abnormal merely—an assemblage of more or less striking features conducing to or resulting in a local peculiarity. Two sturdy objections are persistently hurled in opposition to the juvenile class of mines. One is the uncertainty of their value; the other is the time necessary to determine it. To the former of these objections it may with safety be replied that uncertainty no more attaches to well-selected young mines than to the bubble schemes they are contrasted with; and when it is taken into account the amount involved in their respective acquisitions and the *denouement* of so many of the flagrantly purchased highly priced class the term uncertainty appears to lose its significance in respect of the former class, and to acquire most prominent significance in respect of the latter; at any rate, there is this in favour of the unpretending that one party does not empty its pockets to replenish or fill those of another with the prospect that for 1-20th part of the outlay better and more lasting results will be obtained. Many of the so-called developed mines are scarcely advanced a stage beyond Nature's development, and that is oftener than not but indifferently understood. A fully developed mine affords an exhibition of all its chief features at reasonable depths, whilst in respect of a great many flippantly, so designated, comparatively undeveloped would be the proper term. The objection as to time necessary to the development of young mines I purpose replying to in my next letter. ROBT. KNAPP.

Ione City, Nye County, Nevada, Aug. 31.

ELECTRIC FURNACE—HEAT OF THE ARC.

SIR,—I some time since ascertained by actual experiment that very little heat was radiated from an electric lamp—a Gülcher—notwithstanding the intensely high temperature which is known to prevail in the arc. At considerably less than half an inch from the ends of the carbon the temperature was insufficient to ignite a wax vesta. You may, therefore, judge my surprise at reading the subjoined account of an arrangement in which the arc is utilised for melting metals on a comparatively large scale. It is stated that the electric furnace possesses two great advantages—the temperature which can be produced is only limited by the refractory resistance of the crucible, and the heat is developed in the materials which are to be melted, without first traversing the recipient: 6 lbs. of forged iron were submitted for 20 minutes to the action of the arc, and the metal was then poured into a mould. It was found to be crystalline, and could not be forged. This difficulty may be remedied by adding a little manganese before pouring out, but the reason of this action is not understood: ¾ lb. of copper were melted in charcoal dust for an hour, at the end of which time all but ¾ oz. had been vaporised. The persons who were present did not perceive any disagreeable effects from the atmosphere which they were obliged to breathe: 8 lbs. of platinum were entirely melted in about a quarter-of-an-hour: ½ lb. of powdered tungsten was submitted to the action of the electric arc in a clay crucible. Very dense fumes escaped, and a cavity about ½ in. deep formed at the summit. The metal appeared to have been melted to only a very slight depth below the cavity. The unmelted portion was covered with very beautiful crystals, which, when examined by a microscope, were found to be prismatic, but they were not very uniform. The crystals were evidently formed by the slow cooling of the distilled vapour. Experiments were tried with various other metals, showing that the quantity of any given metal which can be completly melted in an electric furnace, and the time required for the fusion depend upon the interval between the point of fusion and the point of vaporising, as well as upon the thermal conductibility of the metal. Thus it happens that platinum is melted much more easily than steel, and in a much greater quantity for the same expenditure of energy.

Now, I notice that the quantity of each metal melted was large, yet in the case of the tungsten the heating effect was obviously very local, and the result generally anything but uniform; and I should be very glad if any correspondent who has made further experiments would state through the *Mining Journal* whether this want of uniformity is noticed in every case or only in dealing with certain metals. It is of course ingenious to have applied electricity in this way to the melting of metals; but at the same time the results, taking the above as a correct record, seem to show that from the extremely local character of the heat obtainable from an electric arc, electricity could never be usefully applied in metallurgical processes outside the laboratory. I should, however, much like the opinion of others.—*London, Sept.* 22. ARC.

MISTAKES IN MINING.

SIR,—While spending the summer vacation in Clear Creek County, Colorado, I noticed that it was unusually quiet, and although the usual quantity and quality of mineral were sold to the sampling-works at an unusually high rate, there was a lack of activity as far as concerned investments. There were but few new mines worked, and some of the old ones, which have been and are still capable of producing large quantities of ore and at fair profits, if properly managed, were idle. As a cause of this it was suggested that Clear Creek County had lost favour with Eastern capitalists, because it had not done what they expected it would. If the mines of this county cannot influence capital it is not caused by any want of value on the part of the mines, but through mistakes made by the capitalists themselves. To call attention to a few of these mistakes, without reference to the mines at which they were made, will not be out of place.

It is a mistake to believe that a vein is a continuous orebody that will always carry ore, and that the assay value of the ore will increase as depth is attained. It is a mistake to believe this, and provide no capital for development. It is a mistake to expect from a mine when once opened up more than a fair percentage of profit on a fair valuation. It is a mistake to judge of the value of a mine, or even of a stope, from specimen assays. It is a mistake to accept the opinion of a young mining engineer fresh from some Eastern mining college, in regard to a mining or milling investment. The young man in taking charge of the property obtains considerable valuable information and experience, but his company unfortunately has to pay for it.

The above is written with no intention to disparage graduates of institutions of technical training, but to imply that theory in mining is useful only in so far as the mining engineer is capable of combining it with practice. We have had altogether too much of the theoretical man in Colorado. He has made the greatest number of mistakes. He comes here entrusted with business important both to the reputation of our State and to the interest he represents. All theory—no practice—no business education. He thinks mine management a profession. It is a business as well. Ground is to be let. This requires a knowledge of its value per foot or fathom for breaking, and the royalty it can command. Contracts are to be made. Rents are to be determined, and other business to be transacted. Mineralogical, geological, or any technical training, although of great value, is not all that is required. The manager of a mining property must have a business knowledge of mining. Surely the man of theory has left his mark in Clear Creek County.

It is a mistake to sink a perpendicular shaft and drive a cross-cut to work the veins of Clear Creek County, when in every case an incline would be less expensive and answer the purpose as well. It is a mistake to drive a cross-cut tunnel 1500 ft., at an expense of at least $25 per foot, and not secure a title to a single vein that it will intersect. It is a mistake to work the mines of Clear Creek County by any other than the "tribute system." It is a mistake to build tramways, concentrating, or stamp mills when there is only a prospect of obtaining ore. It is a mistake to build a plant to treat ore by some new "$10 a ton and save 99 per cent. of the assay value" process, without first making a thorough but comparatively inexpensive enquiry into the chemical and mechanical laws upon which the new idea is based. It is a mistake to run a mine in debt and then expect to pay up by allowing the tributers to produce the greatest quantity of mineral in the shortest space of time by gouging and understoping. It is a mistake not to keep the development work of a mine in advance of the work of extraction. In Clear Creek County it is a mistake not to open up at least 5 fms. of ground for every fathom stoped. It is a mistake to build a $40,000 mill on property that belongs to some outside party who, after completion, will give a lease for only a year. It is a mistake to think that the merchantable ore of Clear Creek County will pay the cost of transportation to a concentrator that is far remote from the mines. I fear it would be a mistake to attempt to treat the ores of Silver Plume at that place, as has been suggested by some. They do not contain enough lead for treatment in a water-jacket. They contain too much lead to waste by any process that does not secure the lead. They contain too much zinc. They are too refractory. The only advantage they possess is their grade. They command the very highest rate in Golden and Denver, when they are mixed with less refractory ores, and only by judicious mixing can they be smelted with profit. Mining in Clear Creek County is profitable, but not to parties who make the mistakes I have mentioned. No enterprise can succeed where errors of equal importance occur.

New York, Sept. 15. GEORGE C. TILDEN, C.E.

—Engineering and Mining Journal.

HOW TO FORM A BOARD OF DIRECTORS.

SIR,—Holders of property desirous of obtaining capital for its development by transferring it to a public company are frequently at a loss to obtain a competent and influential board, the announcement of which on a prospectus, would be calculated to give confidence to the public; yet it seems that the process, when once ascertained, is extremely simple. I was allowed to-day to take a copy of so much of a letter, sent to a friend, as I give herewith, asking him to become a director of a mining company to be brought out, and it is so rich that I am sure the readers of the *Mining Journal* will appreciate its reproduction:—

"A mining company now being formed requires to fill its board of directors, and we suggest it to you as a favourable opening to a position of business engagement, whilst at the same time distinctly separated from trade, still permitting the acquisition of considerable profit, beside the actual consideration for the position, and there are emoluments which we will explain otherwise.

"It gives also at least a visit to London monthly free, introducing you to desirable acquaintance, and, we would remark, the financial part can be arranged so far as you are concerned by your note.

"You will, of course, bring the matter before your friends, and no doubt your being a director will tend to give them confidence, and we hope they will become very considerable subscribers.

"We have the highest reports on the property, and the office will be at well-known people in London, whom we intend introducing the board to as soon as the preliminary arrangements are made. If you would wish to place a friend in the office no doubt this could be arranged.

"We may say the time required to be given would be an hour or so per month, and the remuneration would be (say) 5*l.* 5s. at each meeting of the board per director. No previous acquaintance with the business, which is formally arranged by the secretary, is necessary; and we need not point out to you that in such a fluctuating property as mining that very considerable advantage arises in regard to the early receipt of news, giving opportunity for selling or buying or operating in the shares, all of which we can arrange.

"The usual commissions allowed on supplies will be divisible as part of the consideration, and the office of auditor can be filled, we have no doubt, by any gentleman who takes an interest, and whom the board felt desirous should be invited to that position. Please let us hear early, and what you take and can guarantee from your friends. . . . ——"

I can only ask whether this is a true picture of the mode in which such matters are usually carried on. I can scarcely think so, though I fear there is too much truth in it as an illustration. J. C.

Sept. 26.

MINING NOTES AND RECOMMENDATIONS.

(PROPOSED MINING BOARD.)

SIR,—Several years ago I made a few notes on the above subject worthy, it appears to me, the consideration of your readers. The society here proposed would have for its object the protection of the mining public, and that being so I doubt not they will be interested in some measure as to the way it can be brought about. That there is need for some sort of protection none will deny; indeed, the want of it has resulted in attempts to establish companies having that object in view. The disreputable system which has been insinuated under the cover of mining has called forth from time to time the severest comments of the Press, including your own animadversions, as well as those of many of your correspondents. The extent of the evil which has followed the mischievous practices can never be measured; but it is great, and the ill repute which mining has, consequently, been made to bear is a testimony of it. We have only got to look back a few years to note the numerous worthless mines brought out, the companies of which have already been liquidated or are lingering on with no other prospect. There was no need for many of them to have existed, and they would not have existed, had the public been warned. No reliance could or can be placed on protection companies, because their object is nothing but gain, and, commercially, one company is as fallible as another. As regards individual criticism, however, disinterested, other motives are imputed. The only way, then, of securing anything like a guard on the form of irregularities, to which I have alluded, will be by the united efforts of mining capitalists and their representatives. The formation of a mining board would meet the case.

I submit the following suggestions:—For the purpose of considering this matter let the representatives of the mining interest—dealers, brokers, and others—be called together; and, should it be held practicable, to carry out some such plan as this, and appoint an organising committee. Their duties would be roughly framing rules, admitting members, and other preliminaries. On the enrollment of a sufficient number of members a meeting of the whole body could be called, the rules submitted, Chairman, committee, and secretary appointed, and the nominal subscription of one or two guineas fixed.

That a register of mining companies be kept indexed and marked, to correspond with filed prospectuses, reports, accounts, &c., collected and gathered from every available source. As many of these have been privately kept by our "mining men," a pretty complete file could be made. For preservation they could be bound up in proper sections, and would form an invaluable reference. The introduction or re-introduction of a property could then be easily traced, and its merits canvassed without loss of time.

That a file of home, colonial, and foreign mining papers be kept.

That the board undertake the inspection of mining properties, and that a staff of mining engineers and experts be nominally retained for the service.

That all expenses be defrayed by the vendor or vendee as the board should decide. This is done now, before the purchase of mines is completed, with what effect we know, because of the carelessness and interestedness of contracting parties.

That the board have power to endorse or reject the prospectus of a company; or, in other words, approve or disapprove of it according as they are guided by reports, special information, or their own knowledge. No responsibility to be incurred in any way. These reports, when favourable, would naturally accompany the prospectus, and in the course of time would become an indispensible requirement for every new company.

That on payment of a fee the public could be supplied with any suppressed reports.

That the suppressed report should be advertised; sub-committees could be appointed to assist in reporting.

That a list of approved companies be advertised yearly in the mining press.

That the admission of new members be by ballot.

That quarterly meetings of the society be held for reporting progress.

That the proceedings of the society be reported in the mining press.

That a charter of incorporation be applied for.

I have no doubt that, were such a society established and well conducted, its rules being faithfully adhered to, it would yield considerable influence, and would do real service for the whole of the mining community. It must not be supposed that it would entirely prevent all losses, but much would be done to prevent them. Such a society would provide an antidote for those practices which cause many troubles, losses, and bitter complaints. There is no reason, as far as I can judge, why the "London Mining Board" should not be established—indeed, I believe there is an absolute necessity for it, quite as much so as the existence of the Corporation of Foreign Bondholders.—*Austin Friars.* E. R. GABBOTT.

SAFETY-CAGES FOR METALLIFEROUS MINES.

SIR,—I notice at present a lively correspondence in the *Mining Journal* on the subject of safety-cages, and hope you will allow me to contribute something. For a long time it has seemed to me that cage reformers have persistently got hold of the wrong end of the stick. In all safety contrivances I have hitherto become acquainted with the main principle is that, on the rope breaking, the cage should stick fast somewhere, either to the guides, or to some supplementary arrangement. This seems to me not only unnecessary, but positively objectionable, and I believe that both directly and indirectly the insistance by all inventors on this principle has been very much the cause that the safety-cage has not been perfected and universally adopted long ago. There is no doubt that a really workable safety contrivance would soon be everywhere adopted, not alone for the protection of life, but also to promote economy, especially by greatly increasing the working life of the pit-ropes.

The stick-fast principle is unnecessary, because when a rope breaks what is actually wanted is not that the cage should remain unmovable, but that it should refrain from rushing away down the guides at a headlong and ever-increasing speed, and smashing itself and everything else at the bottom of the shaft. The principle is objectionable, because when the stick-fast system acts successfully (which is not always the case), there is a general smash up of the guides at the point where the cage remains suspended, and often serious breakages of other pit fittings; besides, when a cage is stuck in the middle of a shaft a few hundred fathoms deep it is often not too easy to get at, and, even at the best, repairs in such a position should be avoided as much as possible; and, again, it is well known that owing to the unavoidable complication inseparable from all contrivances aiming at a stick-fast these contrivances often come into action when not required, causing much delay and annoyance.

It is my firm opinion that a practicable safety-cage would be more speedily arrived at if inventors would turn their attention not to making the cage stick hard and fast, but to providing an arrangement, which would allow the cage to drop easily down the shaft, and arrive at the bottom in a respectable fashion. By such a contrivance breakage of guides would be avoided; the cage would be delivered at a point where it could be easily hitched on to a new rope, and the haulage would probably not be interrupted for more than an hour, or such time as required to adjust another cable. At the same time such an arrangement, being much more simple, would be much less likely to act when not required.

I may mention that I have some ideas as to the details of such an arrangement, founded on close observation of the behaviour of cages in shafts, but I have not worked out these ideas, as at present I have no opportunity of testing them practically, and, therefore, refrain from mentioning them at present. Should anyone, however, be interested in the matter I shall be glad to give such details as will permit of many arrangements being tested. R. M.

Huelva, Spain, Sept. 15.

LEAD MINING IN CARDIGANSHIRE.

SIR,—In every class of enterprise there are fluctuating periods of animation and periods of depression. A careful observation of these changes secures investors a rare opportunity for a selection to invest in sound and legitimate lead mines; but no doubt, as "M. C." pointed out in last week's Journal, the low price of lead has caused stagnation, and it seems to have paralysed all concerned. On various occasions I have described the size and richness of the main lode at the Bwlch United Mines, at or near the junction, where it has proved to be from 40 to 50 ft. in width, and worth fully 20 tons of lead ore per cubic fathom. For a great length and depth, and even up to the grass roots, comparatively nothing has been done but sinking of two engine-shafts about 150 fms. apart to lay open the main and productive lode in depth which as proved so remunerative for upwards of 50 fms. in depth above the 100, which is now being pushed forward with all speed towards the junction, where the lode is fully expected to be found as productive as in the upper section of the mine, which would leave a handsome profit at the present price of lead. This opinion has been fully borne out by almost every practical mining agent in the neighbourhood.

It is seldom, if ever, a company had such a rare opportunity of estimating the cost of exploration, and the quick returns which will ultimately follow, as the Bwlch Company has 80 fathoms of rich lead ore ground in depth below their 100 fm. level; this has been fully proved by the Goginan Mine, and by their immense returns of rich lead ore for the past 40 years, and their greatest returns were in close proximity to the Bwlch Mines on the same lode. It would be encouraging to the Bwlch Company if their manager would fully explain the position of the mine, and the reward they will obtain if the work which he has recommended is carried out in the Bwlch United Mine, as well as the West Lisburne Mine, which was started with sanguine expectation of opening up a second Lisburne, which is so well known as a great productive and dividend mine for the past 40 years. Thousands of tons of silver-lead have been sold from the West Lisburne Mine, and I fail to see why tens of thousands of tons of the same quality lead ore should not be obtained, as they have the same champion lead-bearing lodes passing through their grant as the Lisburne Mines, and at the same depth much more productive; and as depth is attained the lead will increase, and the West Lisburne Mine will became renowned for its richness, and the capitalists who have invested in this property will be handsomely rewarded for their outlay. As money is cheap and plentiful now is the time to strengthen the capital, and complete the deadwork, as the price of lead is certain to advance at an early period.

Goginan, Sept. 26. W. N.

LEAD MINING IN CARDIGANSHIRE.

SIR,—Your correspondent, "M. C.," in last week's Journal, with reference to the stagnation in lead, says—"Now, it is a well-known fact that when we get to the lowest price, &c., a reaction must set in," &c. In wording this sentence thus he shows great caution, for as one connected with the lead trade I do not seriously believe that this "when" is close at hand, the prospect of lead being one of the gloomiest on record. Over-production is the great bane of this article; it is this alone which has forced the price of lead down to the present level. To encourage, therefore, lead mines of the class he mentions at present only tends to make the stagnation more permanent, especially as in the event of hostilities breaking out in China the 30 per cent. of our lead production which is exported to that country in ordinary times will perhaps have to seek purchasers elsewhere, though all history shows that in time of war the prices of metals in general, and of lead particularly, has rapidly and largely risen. Who, then, I would ask, can predict "when" the lowest price for lead will be reached?—*Notting Hill, Sept.* 26. J. E. A.

PERRANZABULOE MINES.

SIR,—One of the great astronomers said when speaking of the appearance of the moon through a telescope, "It is like the habitation of desolation." The present condition of mining in this district is analogous. There is, however, a silvery lining to every cloud, and there is a likelihood of this becoming a truism in this instance, as it is stated on good authority that the Duchy Mines will speedily be in full swing again, and taking the general prospects of this fine and masterly lode, if the mine is worked, no miner having any knowledge of it can deny but that it contains the component parts of success.

It is also intimated that Wheal Vlow and Budnick tin setts are intended to be worked under one company if advantageous terms can be had of the lords. A company is said to be in course of con-

struction to work the Gravel Hill and Treamble run, and at Perran Wheal Alfred operations are expected to commence this week. It will be seen from the above that the prospects of restoring the prestige of Perranzabuloe as a rich mining district is indeed bright notwithstanding. If these mines are to be worked on the same principle as hitherto, better for the credit of mining they never breathed again, than have to die yet another time of their old complaint—asthma.

That the industry of the district is in such a sad plight to-day is not owing to lack of minerals as many of its lodes have been proved over and over again to abound in them, but the fact of the matter is the capital subscribed to develope its mines has been frittered away by idiotic experimentalism and infernalism. Consequently the mines have been gutted, "beaten away," to the bottom levels, leaving no reserves, working on the penny-wise and pound-foolish system until funds run short; result—could not afford to sink the shafts, then asthma or the inevitable wind-up. When the mines are worked again my advice to the promoters is let them be worked on the Cost-book system legitimate or Limited and for heaven's sake let a new era dawn on mining in Perranzabuloe. W. NINESS.

Perranporth, Sept. 26.

THE PREFIX HUEL AND WHEAL.

SIR,—I scarcely anticipated when I forwarded my communication on the prefix "huel" and "wheal" to the names of the Cornish mines that such a protractive controversy would ensue on the derivation of the terms; but, as stated in my former letter, there are several origins and significations ascribed by various writers relative to the derivation of these words, and as there is such a variance in the opinions of different authors it is unquestionably a difficult matter to say definitely which is the most feasible and correct derivation. The terms, however, are generally accepted as being synonymous, and are known to signify a mine, the word "huel" being more antiquated than "wheal."—*Cheesewring Railway, Sept.* 26. S. J. VINCENT.

THE TREVITHICK MEMORIAL.

In the *Mining Journal* of Oct. 21 last it was announced that Mr. Hyde Clarke proposed to inaugurate a movement for securing a memorial to Richard Trevithick, and it was then remarked that whilst statues and memorials of Watt, of Stephenson, of Brunel, and of many others of less note are frequently met with in the most prominent positions, Trevithick still remains unhonoured by any lasting monument, either in his native county or elsewhere in the kingdom, to commemorate the important place he occupied among the great inventors of the nation. The Athenæum has made some timely remarks on this. The fact is, that because Leupold did record the idea of a high-pressure steam-engine three-quarters of a century before Trevithick demonstrated that the idea was reducible to practice, and because Trevithick did not produce so perfect a machine as was subsequently made, his genius failed to obtain the recognition it deserved, and he had not even the benefit of a published biography until nearly 20 years after his death, when Mr. Hyde Clarke gave, in the Mining Almanac, a highly interesting, though somewhat short, account of his life and labours, in which he expressed the opinion which none will now dispute—that "whatever may be the opinion as to his superiority over Watt or his equality with him, this must be confessed that next to Watt no other man has yet done so much for the steam-engine as Richard Trevithick."

The suggestion was speedily taken up by the Mining Institute of Corwall, the President of which—Mr. W. Husband, of Harvey and Co. of Hayle—being so well able to appreciate Trevithick's genius that he placed the matter before the members in a way which could not fail to command their support, and it is gratifying to find that the proposition has been quite as well received out of Cornwall as in it. The acceptance by Major John Davis of the office of honorary secretary, and the appointment of an influential committee for promoting the Trevithick memorial was referred to in the Journal of Nov. 18, and since that time the movement has been making satisfactory progress. Fully appreciating the claims of the memorial to general support, Engineering has offered some admirable observations concerning it in giving a brief historical sketch of Trevithick's inventions. It is remarked that the setting up of statues to preserve or restore the recollection of past celebrities appears to be coming much into fashion. The memories of Pepin, Daguerre, Montgolfier, and others, have of late been thus complimented in France, and a similar wave of hero-worship would seem to be setting our way also. But between rendering Dr. Johnson in marble and Trevithick in bronze there would be a wide difference. The claims of Daguerre's admirers appear at least doubtful, and more or less uncertainty waits on the memory of most men who have been great in industry and science. But about Trevithick, though he has left nothing behind him to serve as his monument, the records of the Patent Office attest his wonderful fertility of invention, and prove that he lived far in advance of his time.

Brought up among the western mines of Cornwall, his inventive genius naturally turned to improvements connected with the raising of water by pumps, to steam-engines, boilers, &c. The first to appreciate the value of high-pressure steam, which Watt persistently condemned, he was actually enabled, in spite of the rude mechanical devices at his command, to make boilers working at 150 lbs. to the inch; these boilers, 5 ft. 6 in. in diameter, and 40 ft. long, were delivered to the Herland Mines in 1813. The revolutions he effected at that early time in pumping and winding engines were no less complete, and it is remarkable how small, comparatively, are the changes in the winding-engines now used in Cornwall since Trevithick's best and latest types. A man who could at that date not only perceive the advantage to be gained by using high-pressure steam, but showed the world how to use it, was not likely to limit its application to the work, in the midst of which he had been born and bred. His first model of a locomotive, now in South Kensington, was made in 1797; then followed a road engine, worked usefully in 1801, and in 1802 he and his friend Vivian obtained a patent for steam-engines to propel carriages. He tested the practicability of his schemes for steam propulsion before many thousands of frightened Londoners, both by using a steam coach in the streets of the Metropolis, and later, by exhibiting a locomotive working on a circular railway on the site of Euston-square. At the same time he was having locomotives built in Cornwall, in Shropshire, and at Newcastle, that at the last-named place being provided with flanged wheels to keep on the wooden tram-plates. This was in 1804, and there was time for all that Trevithick had done to be forgotten before the public mind was educated to receive its first crude idea of a primitive railway.

So locomotive building, like most other things, brought Trevithick little honour and no profit; on the contrary, his narrow means were time after time exhausted. Still he continued to invent, to patent, and to construct, making money in one direction to lose it in another. He was of a character very different to all other pioneer engineers, in that almost all he did was in advance of the time, so that beyond the revolution he effected in pumping and winding engines for the Cornish mines the demand he sought to supply did not exist. His advertisements fell chiefly on deaf ears in 1812, wherein he announced that he had high-pressure engines on sale or hire for thrashing, milling, sawing, or other farm work, and that he was prepared to supply machines for steam cultivation. Before this he had used steam for dredging the Thames, and this doubtless led to his patent for applying it in steam propulsion (it was not till four years later that he patented the screw propeller). The use of iron and high-pressure steam were the two leading points in his engineering creed, and so he saw the practicability of steam windlasses, of iron floating docks, of iron ships with iron masts and spars, the use of iron tanks for ships' ballast, or to hold drinking water. All these things he patented in 1809, associated with his friend Dickinson. In 1816 the prospect of better appreciation and of more profit in Peru than England attracted his restless and adventurous mind, and at that date he left Penzance to be absent for 10 years, and to return with none of his anticipations realised. This was in 1827, and the few years from that time to his death were devoted to invention and to struggles with poverty, the latter too strong in the end even for his great mind and powerful frame, so in 1833 Richard Trevithick died, without leaving enough to bury him, but avoiding the fate his bitter opponent Watt had declared he deserved for bringing high-pressure steam into use.

A lapse of time has been necessary to clear away the weeds which prejudice and envy encouraged to grow up and smother Trevithick's fame. Looking back over the space of two generations the world can now appreciate him at his full and great value, and can find no other engineer with whom to compare him. If, then, memorials profitably adorn the memories of great men, Trevithick, to whom all the world is indebted, indeed deserves one, and there can be little doubt but that the appeal now being made will be fully responded to. Cornish men should be especially eager to contribute, for in honouring the memory of the greatest man their county has produced, they will also be aiding to keep remembered the leading position Cornwall once occupied as a mining centre, but which now, unfortunately, is a thing of the past.

SOUTH AMERICAN COPPER MINES.

CALIFORNIA IMPROVED MACHINERY UTILISED IN COPPER PRODUCTION.

For many years the copper production of Chili has been from 70 to 75 per cent. of the world's production. In consequence of a falling off in the grade of ores, as well as competition from Spain and the United States, the output has been gradually diminishing during the past few years. Up to this time only the slow and crude process of reverberating and stone-blast furnaces have been used, which even in a country of cheap labour cannot stand the competition of improved mechanical appliances. Waking up to the necessity of adopting the latest American improvements, which have stimulated production so largely in this country for the past few years, a representative of some of the principal mines in Chili recently visited this city for the purpose of familiarising himself with the improvements referred to. After a thorough investigation of the whole matter, an order was placed for one of the famous Pacific Copper Smelters of Rankin, Brayton, and Co., of San Francisco, with the assurance that if such results are obtained there as are universally given in this country they will adopt them for their whole system of mining.

The gentleman referred to expressed great astonishment at the facts submitted in regard to the cost of handling ores with this smelter, and admitted that for the effective and economical treatment of all classes of copper ores no other process in the world could compare with it. This evidence of the appreciation of an American invention, coming from a people slow to adopt new ideas, especially foreign ones, is a marked instance of the progressive character of that people, as well as another gratifying assurance of the admitted superiority of Pacific Coast mining machinery.

— *San Francisco Mining Stock Report.*

FOREIGN MINING AND METALLURGY.

An upward tendency is remarked in the French Iron Trade. A meeting of ironmasters at Valenciennes last week decided unanimously that the price of iron should be fixed at 6*l.* 12s. per ton, or 6*l.* 16s. per ton free at Paris. As iron has been sold of late at Paris even at 6*l.* 8s. per ton, the new price is an advance of 8s. per ton upon the lowest rates recently reported, and in any case an advance of 4s. per ton upon the quotations recently current. It does not appear probable that there will be much difficulty in maintaining the proposed quotation of 6*l.* 16s. per ton if forges do not sell below that rate in an underhand manner. One circumstance which certainly appears likely to strengthen prices is the fact that employment has become more general, and that orders for railway plant have come in on all sides. The Northern and Eastern Steelworks Company has obtained a contract for a rather important lot of steel tyres to be supplied to the French State Railways. The Eastern of France Railway Company is about to let a contract for 5000 tyres. The Southern of France Railway Company has concluded a contract with the Chatillon and Commentry Company for 1000 axles for carriages at 21*l.* 8s. per ton. The Western of France Railway Company has also ordered 15 tank engines from the Creusot Works. These engines are to weigh 30 tons each, and the contract price is 68*l.* per ton. The St. Chamond Works have received an order for 1200 hydraulic brakes to check the recoil of cannon. There are no very striking circumstances to report in connection with the German iron trade. Prices have remained low; but the decline recently observable appears to have been checked, and the markets have of late presented something of a firm tone. Buyers show considerable hesitation in entering into engagements for a long period in advance. Their only desire appears to be to meet the current requirements of consumption.

Another week has passed away without bringing to the Belgian iron trade the decided improvement in affairs which was hoped for two or three months since; the situation, indeed, remains generally the same. The great works are relatively well employed, and are, accordingly, somewhat disposed to advance their rates; but many of the small establishments are short of orders, and are obliged to seek out clients. This naturally prevents any general upward movement. It should also be noted that the large works are only assured employment for a few weeks in advance, instead of for some months. English casting pig continues to be quoted at 2*l.* 5s. 10d. to 2*l.* 6s. 10d. per ton, while Belgian casting pig is supported at Charleroi at 2*l.* 16s. per ton. Refining pig has shown some little firmness; many of the blast furnaces are engaged until January, 1884, and a quotation of 2*l.* 4s. per ton is well maintained for hard pig. In the case of small transactions 2*l.* 5s. per ton has even been obtained. Ordinary pig has made about 2*l.* per ton, and mixed pig 1*l.* 16s. per ton. In the Athus-Halanzy group refining pig has been selling at 2*l.* per ton. No. 1 iron has remained fixed at an average of 5*l.* per ton; but the difference per number has been well maintained. Girders have been in little demand, and makers have considered themselves fortunate if they have obtained a price of 5*l.* 4s. per ton. No. 2 plates have been maintained firmly at 6*l.* 16s. per ton; this quotation places No. 3 at about 7*l.* 16s. per ton, and No. 4. at 10*l.* 16s. per ton. Plates of commerce have been in request at 9*l.* 4s. per ton. The John Cockerill Company has just launched from its Hoboken yard a steamer, the Saint André, built for the Leroy Company, of Havre. This is the sixth steamer which the John Cockerill Company has built for the Leroy Company during the last three years, and the construction of four other steamers for the same company is under consideration. The six steamers already built are named the Saint Luc, the Saint Marc, the Saint Mathieu, the Saint André, the Immaculée Conception, and the Carmen. They are all built of Cockerill steel, and each of the first four can carry a cargo of 1500 tons.

The Belgian Coal Trade presents a firm tone, and a rise is still talked of in certain descriptions for the winter season. It does not appear possible, however, to make any advance in the rates current for industrial coal, as, although metallurgical industry has regained a little activity, it is still far from having reached the stage at which it could support an advance in the prices of raw materials. September has brought with it a little slackening in transactions in coal, but this is what generally happens at this period of the year. As regards coke, a quotation of 12s. per ton may be regarded as the basis price. Some contracts have been concluded at 12s. 5d., or even 12s. 10d. per ton, but they have not been sufficiently numerous to affect the general average. The number of trucks laden with coal and coke which passed over the Belgian State railways in the week ending Sept. 16 was 18,562, as compared with 18,505 in the corresponding week of Sept. 1882, showing an increase of 57 this year. The demand for coal has slackened a little in Germany, but the situation remains generally favourable, and the deliveries made have been upon the whole satisfactory, consumption continuing active. The deliveries of coal from Ruhrort to Holland in the first eight months of this year were 760,751 tons, as compared with 616,359 tons in the corresponding period of 1882, showing an increase of 144,392 tons this year. The deliveries of coal from Ruhrort to Belgium in the first eight months of this year were 133,635 tons, as compared with 109,033 tons in the corresponding period of 1882, showing an increase of 24,602 tons this year. The last report of the Strabsund Chamber of Commerce states that Upper Silesian coal is displacing English coal upon the local markets.

THE NEW PATENT, DESIGNS, AND TRADE MARKS ACT.—No. II.

PROTECTION BY COMPLETE SPECIFICATION.

15.—After the acceptance of a complete specification, and until the date of sealing a patent in respect thereof, or the expiration of the time for sealing, the applicant is to have the like privileges and rights as if a patent for the invention had been sealed on the date of the acceptance of the complete specification: Provided that an applicant is not to be entitled to institute any proceeding for infringement unless and until a patent for the invention has been granted to him.

PATENT.

16.—Every patent when sealed has effect throughout the United Kingdom and the Isle of Man.

17.—(1) The term limited in every patent for the duration thereof is 14 years from its date. (2) But every patent shall, notwithstanding anything therein or in this Act, cease if the patentee fails to make the prescribed payments within the prescribed times. (3) If, nevertheless, in any case, by accident, mistake or inadvertence, a patentee fails to make any prescribed payment within the prescribed time, he may apply to the comptroller for an enlargement of the time for making that payment. (4) Thereupon the comptroller may, if satisfied that the failure has arisen from any of the abovementioned causes, on receipt of the prescribed fee for enlargement, not exceeding 10*l.*, enlarge the time accordingly, subject to the following conditions:—(*a*) The time for making any payment is not in any case to be enlarged for more than three months. (*b*) If any proceeding be taken in respect of an infringement of the patent committed after a failure to make any payment within the prescribed time, and before the enlargement thereof, the Court before which the proceeding is proposed to be taken may, if it shall think fit, refuse to award or give any damages in respect of such infringement.

AMENDMENT OF SPECIFICATION.

18.—(1) An applicant or a patentee may, from time to time, by request in writing left at the Patent Office, seek leave to amend his specification, including drawings forming part thereof, by way of disclaimer, correction, or explanation, stating the nature of such amendment, and his reasons for the same. (2) The request and the nature of such proposed amendment shall be advertised in the prescribed manner, and at any time within one month from its first advertisement any person may give notice at the Patent Office of opposition to the amendment. (3) Where such notice is given the comptroller is to give notice of the opposition to the person making the request, and to hear and decide the case subject to an appeal to the law officer. (4) The law officer is, if required, to hear the person making the request, and the person so giving notice, and being in the opinion of the law officer entitled to be heard in opposition to the request, and shall determine whether and subject to what conditions, if any, the amendment ought to be allowed. (5) Where no notice of opposition is given, or the person so giving notice does not appear, the comptroller will determine whether and subject to what conditions, if any, the amendment ought to be allowed. (6) When leave to amend is refused by the comptroller the person making the request may appeal from his decision to the law officer. (7) The law officer is, if required, to hear the person making the request and the comptroller, and may make an order determining whether, and subject to what conditions, if any, the amendment ought to be allowed. (8) No amendment will be allowed that would make the specification, as amended, claim an invention substantially larger than or substantially different from the invention claimed by the specification as it stood before amendment. (9) Leave to amend will be conclusive as to the right of the party to make the amendment allowed, except in case of fraud, and the amendment shall in all Courts and for all purposes be deemed to form part of the specification. (10) The foregoing provisions of this section do not apply when and so long as any action for infringement or other legal proceeding in relation to a patent is pending.

19.—In an action for infringement of a patent, and in a proceeding for revocation of a patent, the Court or a judge may at any time order that the patentee shall, subject to such terms as to costs and otherwise as the Court or a judge may impose, be at liberty to apply at the Patent Office for leave to amend his specification by way of disclaimer, and may direct that in the meantime the trial or hearing of the action shall be postponed.

20.—Where an amendment by way of disclaimer, correction, or explanation, has been allowed under this Act, no damages are to be given in any action in respect of the use of the invention before the disclaimer, correction, or explanation unless the patentee establishes to the satisfaction of the Court that his original claim was framed in good faith and with reasonable skill and knowledge.

21.—Every amendment of a specification shall be advertised in the prescribed manner.

COMPULSORY LICENSES.

22.—If on the petition of any person interested it is proved to the Board of Trade that by reason of the default of a patentee to grant licenses on reasonable terms—(*a*) The patent is not being worked in the United Kingdon; or (*b*) The reasonable requirements of the public with respect to the invention cannot be supplied; or (*c*) Any person is prevented from working or using to the best advantage an invention of which he is possessed, the Board may order the patentee to grant licenses on such terms as to the amount of royalties, security for payment, or otherwise, as the Board, having regard to the nature of the invention and the circumstances of the case, may deem just, and any such order may be enforced by mandamus.

REGISTER OF PATENTS.

23.—(1) There shall be kept at the Patent Office a book called the Register of Patents wherein shall be entered the names and addresses of grantees of patents, notifications of assignments and of transmissions of patents, of licenses under patents, and of amendments, extensions, and revocations of patents, and such other matters affecting the validity or proprietorship of patents as may from time to time be prescribed. (2) The register of patents shall be *prima facie* evidence of any matters by this Act directed or authorised to be inserted therein. (3) Copies of deeds, licenses, and any other documents affecting the proprietorship in any letters patent or in any license thereunder, must be supplied to the comptroller in the prescribed manner for filing in the Patent Office.

FEES.

24.—(1) There are to be paid in respect of the several instruments fees for obtaining patents and renewals:—

(*a*.) Up to sealing.

On application for provisional protection	£1	0	0		
On filing complete specification	3	0	0	= £4	0 0
or					
On filing complete specification with first application ...				£4	0 0

(*b*.) Further before end of four years from date of patent.

On certificate of renewal.....	£50	0	0

(*c*.) Further before end of seven years, or in the case of patents granted after the commencement of this Act, before the end of eight years from date of patent.

On certificate of renewal.....	£100	0	0

Or in lieu of the fees of £50 and £100 the following annual fees —

Before expiration of fourth year from date of patent						£10	0	0
"	"	fifth	"	"	"	10	0	0
"	"	sixth	"	"	"	10	0	0
"	"	seventh	"	"	"	10	0	0
"	"	eighth	"	"	"	15	0	0
"	"	ninth	"	"	"	15	0	0
"	"	tenth	"	"	"	20	0	0
"	"	eleventh	"	"	"	20	0	0
"	"	twelfth	"	"	"	20	0	0
"	"	thirteenth	"	"	"	20	0	0

and there shall likewise be paid, in respect of other matters under this part of the Act, such fees as may be from time to time, with the sanction of the Treasury, prescribed by the Board of Trade; and such fees shall be levied and paid to the account of Her Majesty's Exchequer in such manner as the Treasury may from time to time

direct. (2) The Board of Trade may from time to time, if they think fit, with the consent of the Treasury, reduce any of those fees.

Registration of New Companies.

The following joint-stock companies have been duly registered:—

THE WEST ARGENTINE GOLD COMPANY (Limited).—Capital 50,000*l.*, in shares of 1*l.* To purchase or otherwise acquire and work mines (whether gold or otherwise), alluvial deposits, minerals, and mining rights, in the Argentine Republic or elsewhere, and to adopt and carry into effect an agreement for the acquisition of a certain mineral property situated in the Department of Saladillo, Province of St. Luis, consisting of five mining claims; also the Carolina Mines, together with all engines, dwellings, plant, machinery, tools, &c. The consideration being 1000*l.* cash and the allotment of 16,000 fully paid up shares. If within eight months 5000 shares at least shall not be subscribed for the above agreement shall be void. The subscribers (who take one share each) are—C. J. Bright, Upton Manor, gentleman; A. J. Young, South Croydon, accountant; J. C. Price, 3, Alfred-street, gentleman; H. L. G. Lane, Wanstead, C.E.; M. Dale, Wanstead, late captain; J. Belcher, 5, Adelaide-place, architect; W. J. Cooper, 7, Westminster Chambers, chemist. The number of directors must not be less than three or more than seven. The subscribers shall determine the members of the first board.

THE TIMBER TRADE MARINE INSURANCE COMPANY (Limited).—Capital 100,000*l.*, in shares of 5*l.* To ensure against every description of marine risk. The subscribers are—C. N. Lawrence, 27, Clement's-lane, 350; J. L. Pierce, 27, Clement's-lane, 300; E. G. Price, 27, Clement's-lane, 300; R. A. Stewart, 3, Plow-court, 700; J. Parsons, 112, Fenchurch-street, 600; R. G. Guy, 112, Fenchurch-street, 300; W. Tucker, Nottingham, 200.

THE SOUTHAMPTON AND SOUTH HANTS CO-OPERATIVE SUPPLY ASSOCIATION (Limited).—Capital 12,000*l.*, in shares of 2*l.* To purchase and carry on an established business at 170, High-street, Southampton. The subscribers are—J. F. Wilkins, Southampton, 10; E. W. Evans, Southampton, 10; W. H. Kinsey, Southampton, 10; G. J. Good, Southampton, 10; J. Strange, Southampton, 5; J. Mitchell, Southampton, 30; W. B. Baker, Southampton, 10.

GRAND HOTEL DES SAPINS DU NOUVEAU BRIGHTON (Limited).—Capital 20,000*l.*, in shares of 20*l.* To carry on in France and elsewhere the business of hotel-keepers and proprietors. The subscribers (who take one share each) are—A. F. Ford, 17, Albany-road; H. McKenzie, Catford; T. W. Fullilove, Catford; F. Thompson, 3, Castle-street; W. Lake, 45, Liverpool-street; B. J. Wildbore, Mile End; T. J. Ward, 18, Ampton-street.

THE WEST INDIA GRAVING DOCK COMPANY (Limited).—Capital 50,000*l.*, in shares of 10*l.* To purchase, lease, or hire, and work the West India Graving Dock, adjoining the West India Docks. The subscribers (who take one share each) are—J. Can, 10, Austin Friars; A. N. Rixon, 10, Austin Friars; G. Brotheridge, 8, Old Jewry; G. Allan, 10, Austin Friars; W. H. Burman, 10, Throgmorton-avenue; J. N. Perrin, jun., Staines; J. Birnie, 2, Westcomb Park-road.

THE ELECTRO-AMALGAMATOR COMPANY (Limited).—Capital 200,000*l.*, in shares of 5*l.* To acquire and carry on the business of a company bearing the same name, and which is now in liquidation. The subscribers (who take one share each) are—R. S. Gladstone, Tower Chambers; C. A. John, 145, Wilberforce-road; N. Trouson, Bromley; T. R. Hewitt, Kensington; F. H. Smith, 50, Coleman-street; W. A. Hornbuckle, 19, Water-lane; A. G. Snelgrove, 6, Lady Somerset-road.

MINTON'S (Limited).—Capital 200,000*l.*, in shares of 100*l.* To continue at Stock-on-Trent the business of manufacturers of and dealers in china, porcelain, parian and other ceramic wares, terra-cotta, &c. The subscribers (who take one share each) are—C. M. Campbell, Stoke-on-Trent; J. W. Minton, Stoke-on-Trent; H. Minton, Stoke-on-Trent; H. M. Robinson, Leek; L. Arnoux, Stoke-on-Trent; A. Reynolds, Stoke-on-Trent; A. H. Roberts, Cardiff; G. Leason, Stoke-on-Trent.

THE BLAKELOW WORKS SYNDICATE (Limited).—Capital 8000*l.*, in shares of 10*l.* The business of pottery works and colliery proprietors, coke manufacturers, brick-tile manufacturers, and coal miners, &c., in all branches. The subscribers who take one share each) are—J. Clayton, 15, Stourcliffe-street; J. J. Sharland, Brixton; H. Mason, Peckham; S. Smith, Clapton; R. H. Dee, 155, Flaxham-road; J. C. Baines, 4, Copenhagen-street; H. T. Turner, 106, Vauxhall Bridge-road.

THE NATIONAL DISCOUNT COMPANY OF WALES (Limited.)—Capital 15,000*l.*, in shares of 1*l.* To carry on a general money-lending and financial business. The subscribers (who take one share each) are—A. H. Roberts Cardiff; A. H. Haniel, Cardiff; W. C. Peace, Cardiff; J. S. Stowe, Cardiff; J. Phillips, Cardiff; W. Burrow, Cardiff; D. Shepherd, Cardiff.

THE WHITSTABLE-ON-SEA LAND AND BUILDING COMPANY (Limited.)—Capital 10,000*l.*, in shares of 5*l.* The general businesses of a land company and a building society at Whitstable and Seasalter. The subscribers (who take one share each) are—E. C. Walter, Whitstable; H. M. Maugham, Whitstable; A. Anderson, Whitstable; H. Bowden, Whitstable; T. Browning, Whitstable; S. Saunders, Whitstable; F. E. Browning, Whitstable.

THE FRENCH PACIFIC MAIL STEAM NAVIGATION COMPANY (Limited).—Capital 100,000*l.*, in shares of 5*l.* The usual business of a shipowner in all branches. The subscribers (who take one share each) are—J. H. Redman, 49, Lime-street; D. M. Upodale, 9, Rood-lane; E. C. Stevenson, 26, Billiter-street; R. S. C. Baker, 6, Lime-street; J. H. Harling, Palmerston Buildings; G. E. C. Quirk, Palmerston Buildings; W. B. Miles, 54, Crutched Friars.

THE YEWTHWAITE PROPRIETARY SYNDICATE (Limited).—Capital 6000*l.*, in shares of 1*l.* To trade as bankers, brokers, and financial agents; to acquire any land, properties, businesses, rights, &c. The subscribers (who take one share each) are—E. Hardley, Liverpool; W. Jones, Stoneycroft; R. W. Munro, Liverpool; E. J. Hale, Liverpool; D. Washington, Mostyn; E. Madden, Liverpool; W. A. Bradley, Flint.

THE SOUTHEND HOTEL COMPANY (Limited).—Capital 40,000*l.*, in shares of 10*l.* To purchase the Royal Hotel, and continue the business in connection therewith. The subscribers (who take one share each) are—A. Mason, 16, Bernard-street; W. W. R. Burgess, Cherborne-street; J. E. Costello, 2, Bucklesbury; H. Tipple, South Hackney; F. W. Hall, Deptford; C. J. Vollhardt, 29, Villier's-street; J. Kayler, 19, Dalston-lane.

STEAM TRAMWAYS IN NEW SOUTH WALES.—Steam tramways although only of recent introduction in Sydney, have already become so largely used as to exercise a perceptible influence on the habits of the residents in the colonial metropolis. Horse tramways, such as are used in London, were found impracticable, in consequence of the numerous heavy gradients encountered at different portions of each journey. The motors have been obtained principally from America, and are compact, light, and possessed of considerable strength. The carriages are something like those in use on the Paris suburban lines, being double decked, and the seats on the roof being under shelter. The Sydney tramways are, in fact, so many street railways, forming to Sydney what the Metropolitan District Railway is to London. At the close of 1881 there were 11¼ miles of tramway in actual use, the number of passengers during the year being 7,090,125, as against 2,086,897 during the previous year. In 1882 there was a further enormous increase, which is being maintained during the present year.

HOLLOWAY'S PILLS.—For the cure of debility, bile, liver and stomach complaints this inappreciable medicine is so well known in every part of the world, and the cures performed by its use are so wonderful, that it now stands pre-eminent above all other remedies, more particularly for the cure of bilious and liver complaints, disorders of the stomach, dropsy and debilitated constitution. A course of these digestive pills painlessly but surely regulates the organs of digestion, and acts most beneficially on the secretory and excretory organs generally. They expel from the secretive organs and the circulation those effete and morbific matters which produce inflammation, pain, fever, debility, and physical decay, thus annihilating, by their purifying properties, the virulence of the most painful and devastating diseases.

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(TUCKINGMILL FOUNDRY AND ROSEWORTHY HAMMER MILLS),
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Engineers, Iron and Brass Founders, &c.

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PUMPING WINDING AND STAMPING ENGINES
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FOR EVERY
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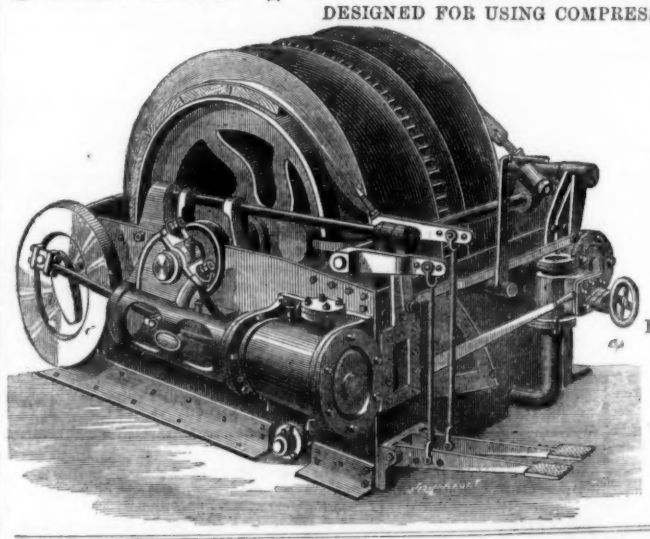

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No. 2 size, 9 in. single cylinder, 2 ft. 6 in. drums.
A,— 6 in. double cylinder, with 2 ft. 3 in. drums
B,— 8 in. " " 3 ft. 0 in. drums.
C,—10 in. " " 3 ft. 6 in. drums.
D,—12 in. " " 4 ft. 6 in. drums.
E,—14 in. " 5 ft. 0 in. drums.

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UARANTEED to do MORE WORK with less power THAN ANY OTHER MACHINE in the World.
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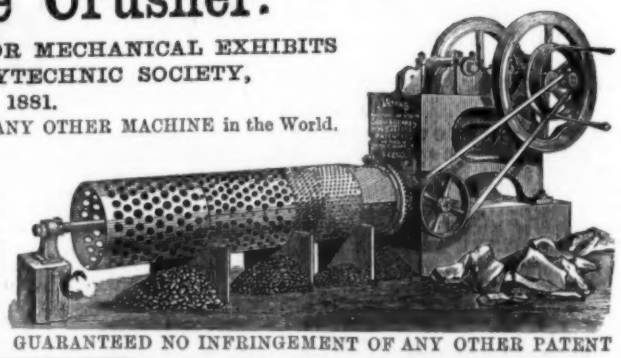

To Mr. Baxter, Leeds. *Cinderford, Feb.* 13, 1883.
DEAR SIR,—I am pleased to be able to tell you that the Machine works splendidly. We are breaking 16 trucks a day now and we thought it a good day's work to do 10 a day with the old Machine, so you can see the difference. I had a gentleman looking at it yesterday, and he was surprised to see it work so easily.
Yours truly, E. ORGAN.
The above refers to one of our 16 by 9 Machines we supplied to replace an "Improved Blake" 15 by 9 Machine.
GUARANTEED NO INFRINGEMENT OF ANY OTHER PATENT
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Its chief advantages are simplicity, durability, strength, and lightness, economy in first cost, consumption of air and repairs, adjustability of cradle and length of feed. Invaluable for use in foreign countries where repairs are so difficult and expensive. The makers undertake to keep the machine in repair entirely free of cost for six months from date of purchase. In order to prove the superiority of these machines, the makers are prepared to send one on trial to any Mining or Tunnelling Company, they being at perfect liberty either to keep it or return it after trial.

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CENTRE SECOND STOP WATCH

Has lever escapement, compensating balance case and dome, both sterling English Hall Marked Silver. The most perfect Watch yet introduced. It is usually retailed at £8 8s.; our price, free by post, is £2 15s.; warranted for five years.

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Do not pay exorbitant profits, but purchase direct from the workshop.

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Every description of Watches and Jewellery at proportionately low prices.

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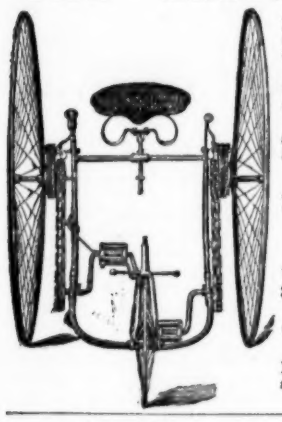

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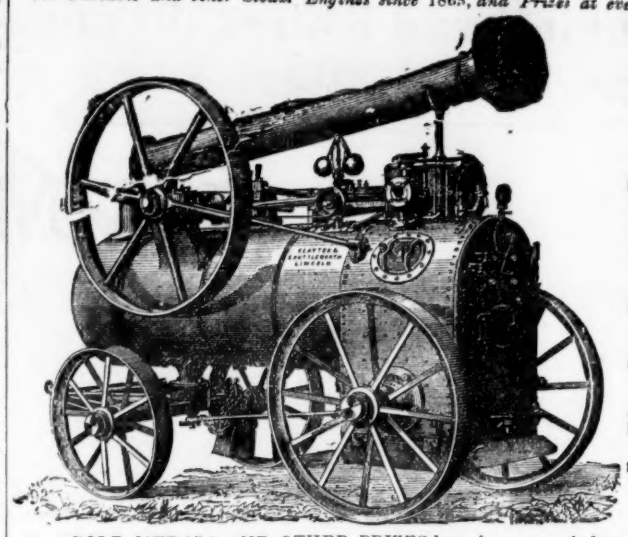

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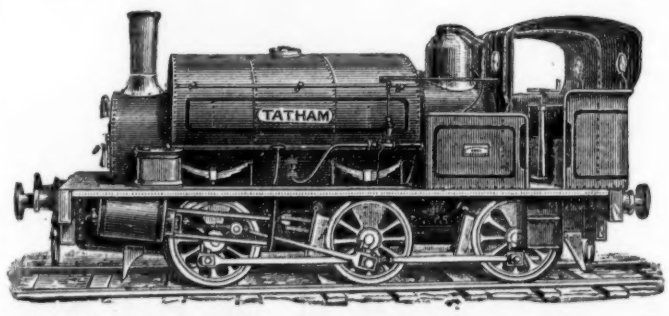

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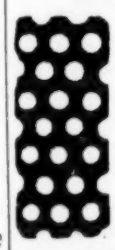

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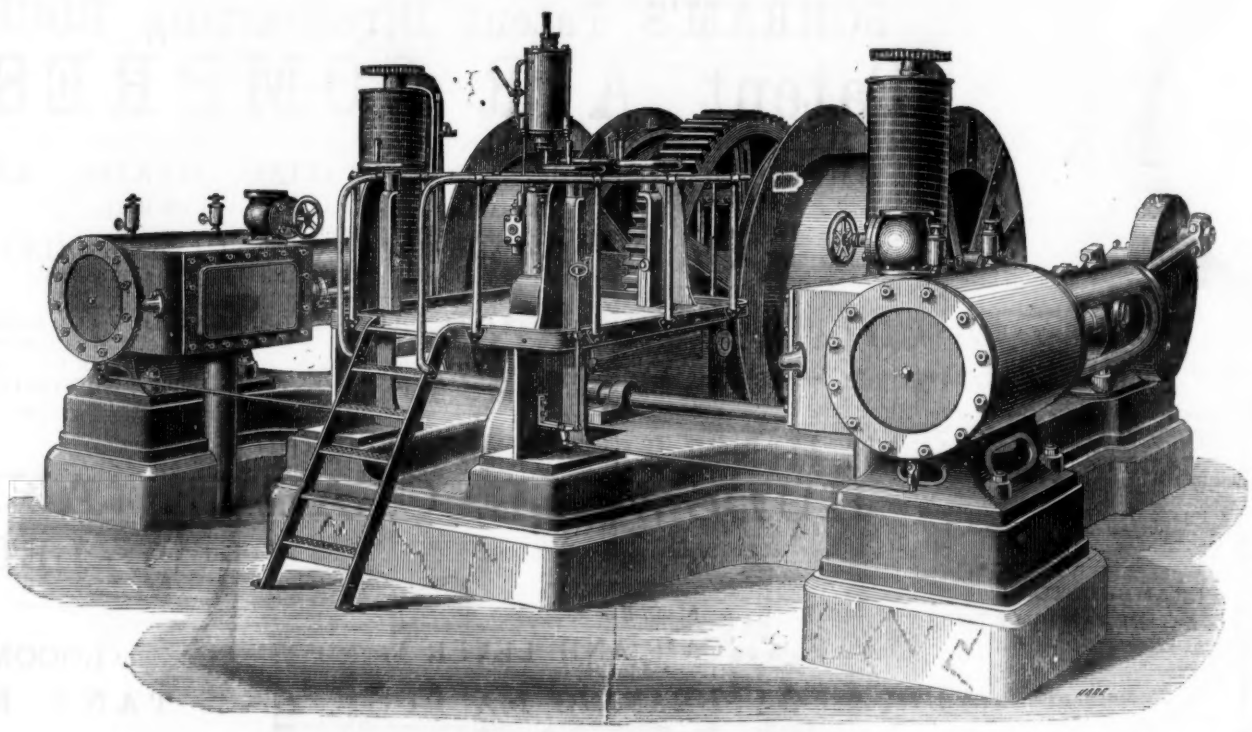

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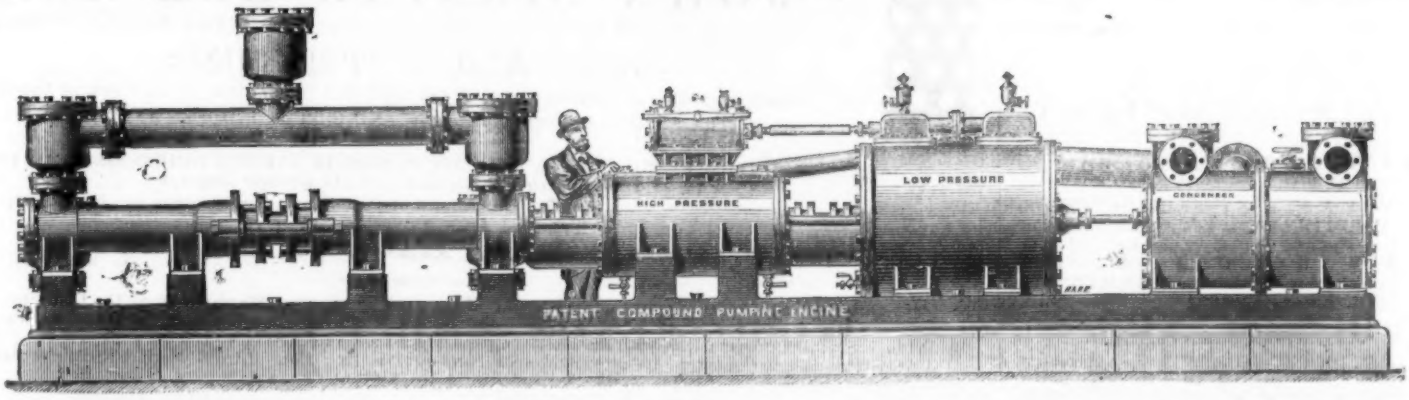

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GOLD QUARTZ, SILVER, COPPER, TIN, ZINC, LEAD,

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OVER **4000** IN USE.

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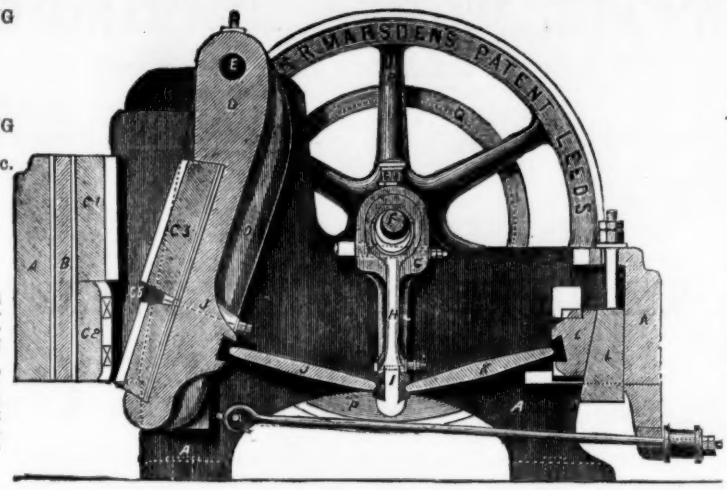
"I have great pleasure in bearing testimony to the merits and capabilities of your patent combined fine crusher and sieving apparatus. I have tried it on a variety of ores and minerals, and it pulverizes them with equal success. You can put in a small paving stone and bring it out like flour."

"The power required to drive it is very small, being from 4 to 5-horse, and the repairs are almost nil."

"I am sure the machine will be a success, and a great one, and there is any amount of demand for such a machine. We can work it with 20 lbs. of steam, and our engine, which is a 12-h.p., plays with the work, in fact we run the Stonebreaker and the Pulverizer both together with 35 lbs."



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ROAD METAL BROKEN EQUAL TO HAND, AT ONE-TENTH THE COST.

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"The 15 × 8 stonebreaker gives perfect satisfaction. It produces a more cubical stone than any others I have seen at work."

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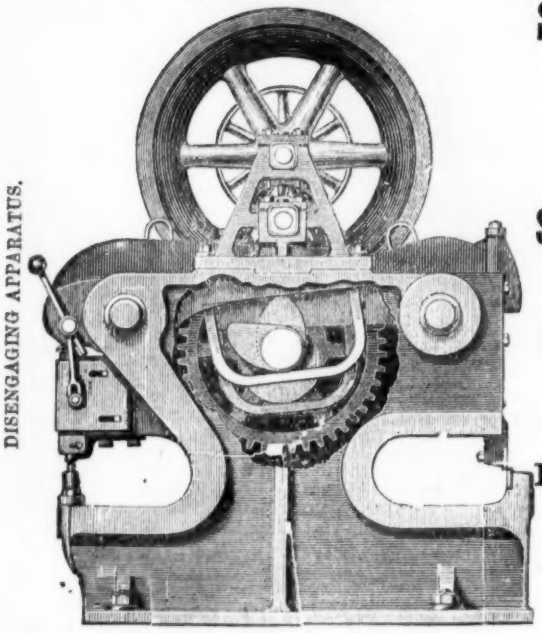

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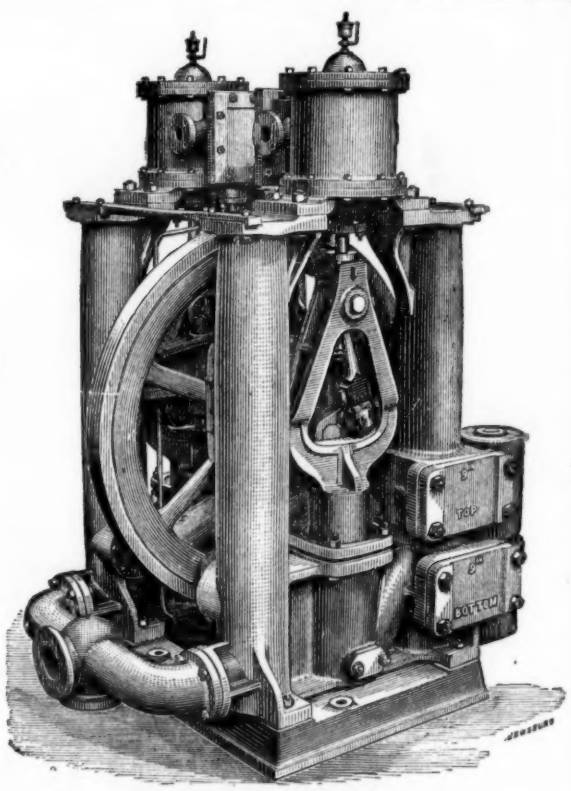

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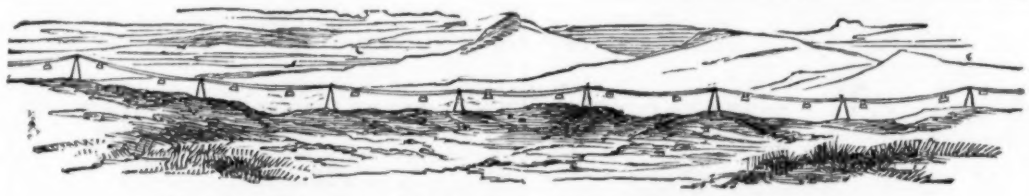

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